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OAKDALE MUNICIPAL AIRPORT

MASTER PLAN

1995-2015

AUGUST 1996

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1. SUMMARY

The City of Oakdale, California, contracted with Wadell Engineering Corporation to prepare a general aviation airport master plan study utilizing a 90 percent Federal Aviation Administration grant under the Airport Improvement Program. The basic intent of the study is to evaluate existing airport facilities, to assess airport demand, and to prepare an airport master plan to accommodate the demand through the year 2015. This summary presents the objectives of the study, the approach utilized in the master planning process, the results of the analyses performed, and the recommendations for prudent and proper protection and development of the Oakdale Municipal Airport. This report is intended to be a useful technical document to allow the elected city official, city staff, FAA, and CalTrans Aeronautics Division to properly develop and protect the airport while enhancing its usefulness to the traveling public.

Study Objectives

Specific objectives of the study are to:

- Determine, in concert with regional planning criteria, a set of forecasts and facility requirements for the development of the airport, considering airport noise and safety issues.
- Describe the concepts and alternatives considered in the course of the study.
- Provide concise and descriptive planning information. The impact and logic of the recommendations can then be clearly understood by the community and public agencies charged with the approval and development of this plan.

Study Approach

This Master Plan covers the planning period of 1995-2015 and includes the following major components:

- Inventory of area planning efforts and background data.
- Forecasts of aviation demand, including the number of operations, aircraft types, and aircraft mix.
- Evaluation of the impact of development on adjacent land uses and on the community.
- Determination of facilities and improvements required to satisfy the forecast demand.
- Estimation of the costs of airport development.
- Recommendation of a plan for the ultimate development of the airport in accordance with community goals and increases in aviation demand.

This study becomes effective only after it has been evaluated, adopted, and implemented. The plan has been designed to accommodate changes in community goals and aviation trends as they develop, imparting flexibility into the planning process. Community participation is invited during all planning phases by the consultant and by the city. Agencies contacted during the course of the study include representatives of Stanislaus County, CalTrans, and the Federal Aviation Administration. Valuable points of view regarding the future of aviation in the area were generated through these contacts and are reflected in the study.

Findings

The Oakdale Municipal Airport is located southeast of the city of Oakdale, three miles from the city center. It is an excellent, well-constructed, general aviation facility occupying 117 acres with one runway serving single and twin engine aircraft, as well as an increasing number of turboprops and turbine-powered business jets. The airport has a non-precision instrument approach to Runway 10.

Approximately 35% of all aircraft owners at the Oakdale Municipal Airport are from Oakdale, and 44% from other parts of Stanislaus County. The remaining 21% are primarily from the neighboring counties of San Joaquin, Tuolumne, and Alameda. Presently, 55 aircraft are based at the airport. The total is expected to increase to 80 by the year 2015. Growth will occur in all categories of aircraft, especially turboprop and turbine-powered business jets. Runway operations will increase to 51,380 by the year 2015, all of which will be general aviation.

To meet increasing aviation demand and improve airport safety, additional facilities and reconstruction of existing facilities will be necessary throughout the planning period. The existing 3,020 foot runway does not adequately handle the lightest business jets. A runway extension to 4,400 feet total length and widening to 75 feet are needed to meet growing aviation demand and to improve safety. Increases in covered aircraft parking facilities will be required; the development of T-hangars for the storage of based aircraft are recommended in the Master Plan.

Airport plans depicting the airfield area, terminal area, and approaches to the airport and stage development plans depicting the capital improvement program were prepared. The plans explain how the growing needs of the Oakdale Municipal Airport can be met through the year 2015.

Stage I

The projects of the first stage of development, 0-5 years, are (1) land acquisition for the extension of Runway 10-28 to the east, (2) irrigation channel relocation and structures under the extended runway and taxiway, (3) earthwork and drainage for the runway extension, (4) extension of the runway 75 feet wide by 1,380 feet long with lighting, and (5) extension of the parallel taxiway system with lighting. Additional projects include development of T-hangars with taxiways and fuel farm replacement.

The Capital Improvement Program Cost Summary Table on the following page shows that the most significant expenditures during the 20-year capital improvement program occur in Stage I. These expenditures are needed for the runway extension, associated taxiway and lighting systems, and T-hangar development.

Stage II

The second stage of development, 6-10 years, includes (1) additional hangars with taxiways, and (2) a localizer/DME navaid.

Stage III

The third stage of development, 11-20 years, primarily concerns (1) additional hangar development, and (2) hangar taxiways.

The capital improvement program cost summary associated with the three stages of development is shown in the following table.

**Capital Improvement Program Cost Summary
Oakdale Municipal Airport
(In 000's 1995 \$)**

Stage I (1995-2000)	\$2,522,300
Stage II (2001-2005)	\$512,500
Stage III (2006-2015)	\$207,100
Total	<u>\$3,241,900</u>
FAA/State Funds	\$2,548,100
Local Funds	\$693,800
Total	<u>\$3,241,900</u>

Source: Wadell Engineering Corporation

The FAA grant program provides 90% grant funding for eligible projects. The projects that are not eligible are auto parking, hangar construction, and private facilities such as fixed base operators, hangars, and fueling systems.

A 20-year cash flow analysis was prepared to model the income and expense. The resulting operating profit was combined with the local share of funds to match FAA and State grants for development, and for construction of non-eligible facilities.

Recommendations

It is recommended that the City of Oakdale adopt the Oakdale Municipal Airport Master Plan, 1995-2015, and undertake the following steps:

- Use the Master Plan as City policy for development on and adjacent to the Oakdale Municipal Airport.
- Apply to the Federal Aviation Administration and the State of California for land acquisition and construction grants for facility expansion at the Oakdale Municipal Airport.
- Implement the development program at the Oakdale Municipal Airport, with emphasis on Runway 10-28 expansion and protection, installation of nav aids.
- Apply for State of California aviation fund loans or municipal leasing funds for City hangars, and develop revenue-producing facilities at the airport to generate matching funds for future airport development and maintenance grants.
- Adopt new height zoning ordinances and zoning protection for the Oakdale Municipal Airport in accordance with its expanded role described in the Master Plan.

2. INVENTORY

The inventory is prepared to provide a description of the airport location and setting, the climatic and geographic features of the area, and the history of the airport. The on-airport and off-airport land use and facility development is described, including the airfield area, terminal area, and airspace. Pertinent information is presented to identify the type and nature of aviation use and the airport tenants.

Location and Setting

The City of Oakdale is located in the San Joaquin Valley in Stanislaus County in central California, approximately 85 miles east of San Francisco. The nearest larger city is Modesto, the County seat, approximately seven miles to the east. Refer to Exhibit 1, Location Map.

The city of Oakdale encompasses 2,540 acres (four square miles) and has a population of approximately 14,500 persons.

Oakdale is an agricultural market center community. The land within the existing City limits is primarily urban, centered around the downtown business district in the historical center of the town. Adjacent uses surrounding the City include orchards, row crops, dairy farms, and food processing facilities.

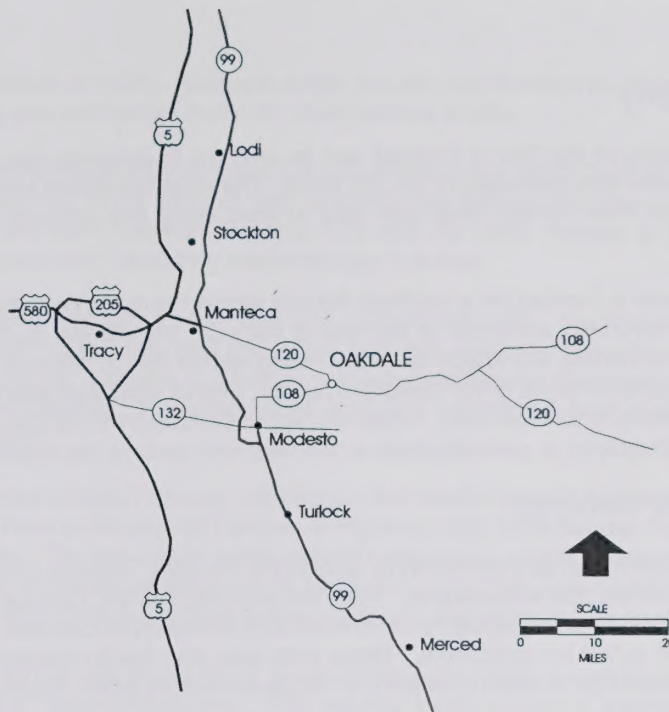
Oakdale Municipal Airport is located about two miles east of the Oakdale city limit along Sierra Road. Access to the airport is via Laughlin Road from Sierra Road. Although two miles east of the city limits of Oakdale, the airport site itself is in a separate precinct owned by the City.

Climate

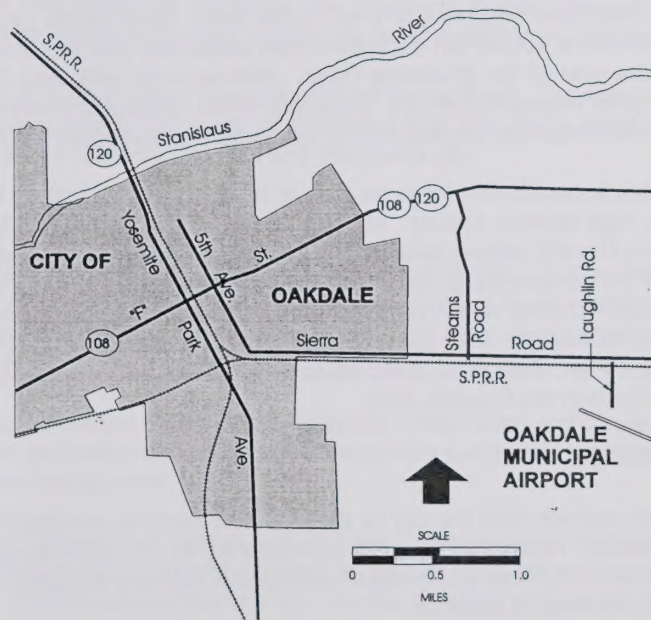
The climate of Oakdale is typical of the San Joaquin Valley, with mild winters and hot, dry summers. The average temperatures range from 46 degrees to 80 degrees. Rainfall is moderate, averaging about 12 to 14 inches per year, as is typical of the Valley, and occurs primarily during the winter months (November through March). Frequent temperature inversions which occur during the winter cause low stratus fog conditions, resulting in poor ground level visibility.

Based upon National Weather Service Data from Stockton, the prevailing winds in this part of the San Joaquin Valley are from the west or west-northwest during the nine months between March and November. During the winter months of December, January, and February, winds are typically from the southeast.

During the preparation of the previous Master Plan for Oakdale Municipal Airport, a recording device was installed to mechanically read wind speed and direction. The time period covered was January 1977 to January 1978. The findings of the locally monitored data generally corresponded to the data from Stockton, 25 miles away. The local data indicated that the winds have a slightly more northerly component than that recorded at Stockton.



Location



Vicinity

Exhibit 1 Location Map Oakdale Municipal Airport Master Plan



Geography

The topography of the City of Oakdale and its environs is generally flat, except for gently rolling areas southeast and northwest of the city limits. The most significant natural feature in the area is the Stanislaus River, which flows from east to west along the northern edge of the present city boundaries.

The airport site is located on a relatively flat site which has been partially leveled and filled to accommodate a runway extension of 620 feet to the east, undertaken approximately 15 years ago. The area surrounding the airport is gently rolling terrain with numerous swales and some small hills. An irrigation channel of the Oakdale Irrigation District is located east of the airport site. Elevation of the airstrip is 234 feet MSL. Small hills approximately 30 to 40 feet higher are located to the east. The topography is generally lower to the west and north of the airport.

Soils and Geology

Most of the Oakdale area is underlain by soils of the Hanford, Tujunga, Cometa-Montpellier, Greenfield, and Oakdale soil associations. With the exception of the Cometa-Montpellier association, which typically occurs on alluvial terraces north and northeast of Oakdale, soils within the area are generally well suited for agriculture. These soils also offer few limitations for urban land uses, as soil texture, drainage, erosion potential and slope are factors which introduce similar limitations for either use.

Oakdale is located in the eastern part of the Central Valley, a structural trough between the Sierra Nevada and the Coast Range. Geologic formations of the Central Valley include a bedrock complex of metamorphosed marine sediments, overlain by alluvial (river), lacustrine (lake), and marine sediments to a maximum thickness of over 30,000 feet. More recent geologic formations in the Oakdale area consist of alluvial fan deposits of fine sands and silts laid down by various rivers and flood plains in the area of the Stanislaus River. Near-surface sediments in the Oakdale area are primarily flood plain deposits from the Stanislaus River, although continental sediments formed 25,000 to 13 million years ago are exposed at the surface in some locations.

The Central Valley is considered to be an area of relatively low seismicity in a state characterized by moderate to high seismic activity. Although a few of the fault zones formed within the Coast Range and Sierra Nevada extend beneath the sediments of the Central Valley, no active faults are known to reach the surface within Stanislaus County. The Midland and Tracy-Stockton faults, located about 45 and 10 miles west/northwest of the Oakdale area, respectively, are capable of displacing bedrock formations and some of the overlying sediments. However, according to Oakdale's General Plan, there is no evidence to suggest that either of these faults is likely to cause surface displacement in the Oakdale area.

Ground Access

Regional highway access from the city to the east and north is provided by State Highways 108 and 120, respectively. These two highways converge within the city limits and provide access from the city to the west. Highway 99, a major north-south highway through Central California, is located 15 miles to the west of Oakdale.

Yosemite Avenue (State Route 120 and County Road J-14) and F Street (State Route 108 and State Route 120/108) are the main thoroughfares within the City of Oakdale, dividing the city into four quadrants. The Stanislaus River forms the northern boundary of the city limits and acts as a physi-

cal barrier to the movement of traffic. Railroads within the city also function as physical barriers to the movement of traffic and can disrupt traffic for short periods of time.

Commuter and recreational travel are two types of travel patterns that affect Oakdale's traffic. Commuter travel is increasing due to the influx of new residents that work in Stockton or the Bay Area. Recreational traffic to and from Yosemite National Park and the Sierra Nevada is heavy on State Route 120 and State Route 120/108 during weekends and holidays.

To accommodate existing and future commuter and recreational traffic, two limited access highways are being proposed by Caltrans and Stanislaus Area Association of Governments (SAAG) in the area adjacent to Oakdale. Caltrans is currently preparing preliminary corridor plans for a Highway 120 Bypass around Oakdale. Two alternatives are being considered, both of which would be located north of the airport.

SAAG is planning a limited access Highway 108 Bypass that would begin in Modesto, run south of the city of Oakdale and end to the east of Oakdale at Highway 120. In its General Plan Update, the City defined two options. The first option would extend northerly to existing Highway 120 west of the airport. The second alignment option extends south and east of the airport and intersects existing Highway 120 near Wamble Road. Either option would provide better access to the airport.

It should also be pointed out that Sierra Road is one of the major truck routes in Oakdale. Sierra Road is designated as a collector roadway. The existing traffic volume is approximately 1,300 Average Daily Traffic (ADT), which represents a Level of Service "A" as indicated in the Draft EIR for the Oakdale General Plan.

In addition to road transportation, Oakdale is served by three freight rail companies. These include the Atchinson Topeka and Santa Fe (AT&SF), the Southern Pacific Transportation Company (SPTCo) and the Sierra Railroad. Passenger rail service is not available in Oakdale.

The Sierra Railroad line is located along the south side of Sierra Road. The access road to the airport crosses the rail line at grade, just south of its intersection with Sierra Road. The Sierra Railroad provides freight service between Oakdale and Tuolumne city.

Airport History

Oakdale Airport was established in 1947 as a private aviation facility. At that time, the field consisted of an 1,800-foot primary runway and a 1,650-foot cross-wind runway, both unpaved and unlighted. A main hangar, a Quonset, and some out-buildings were constructed to house a flying school that trained pilots.

In 1960, the Airport was purchased by the City of Oakdale, which owns and operates it to this date. Fifty-seven acres of land and major airport improvements were purchased together with the fueling system and miscellaneous equipment.

The unpaved crosswind runway was abandoned and the primary runway improved in stages. A parallel taxiway was added and lighting was installed by the city. The old single training facility has given way to a modern Fixed Base Operation (FBO), engine overhaul shop, and T-hangars.

The runway and taxiway were extended to the east as a result of the 1978 Master Plan from 2,400 feet to the present 3,020 foot length. The runway is 66 feet wide and has an asphalt surface. The airport currently encompasses 117 acres of land.

The airport is owned and operated by the City of Oakdale and administered by the City Administrator's office. The City Council is responsible for major policy decisions.

Aviation Facilities

Aviation facilities inventoried include the airfield area, the terminal area, and the airspace/navigational facilities.

Airfield Area

The existing Oakdale Airport is comprised of 117 acres of land with one paved runway. The runway and the runway approaches are described below. See Exhibit 2: Airport Photomap.

Runways

The existing airfield at the airport consists of the following runway:

Table 1
Runway Characteristics
Oakdale Municipal Airport

<u>Runway</u>	<u>Orientation</u>	<u>Dimensions</u>	<u>Effective Gradient</u>	<u>Surface Composition</u>
10-28	E-W	3020' x 66'	0.4%	Asphalt

Source: FAA Airport Master Record #5010 for the Oakdale Municipal Airport, January 1994.

The east-west runway 10-28 is 3,020 feet long. The terminal and hangar areas, are located north of the runway.

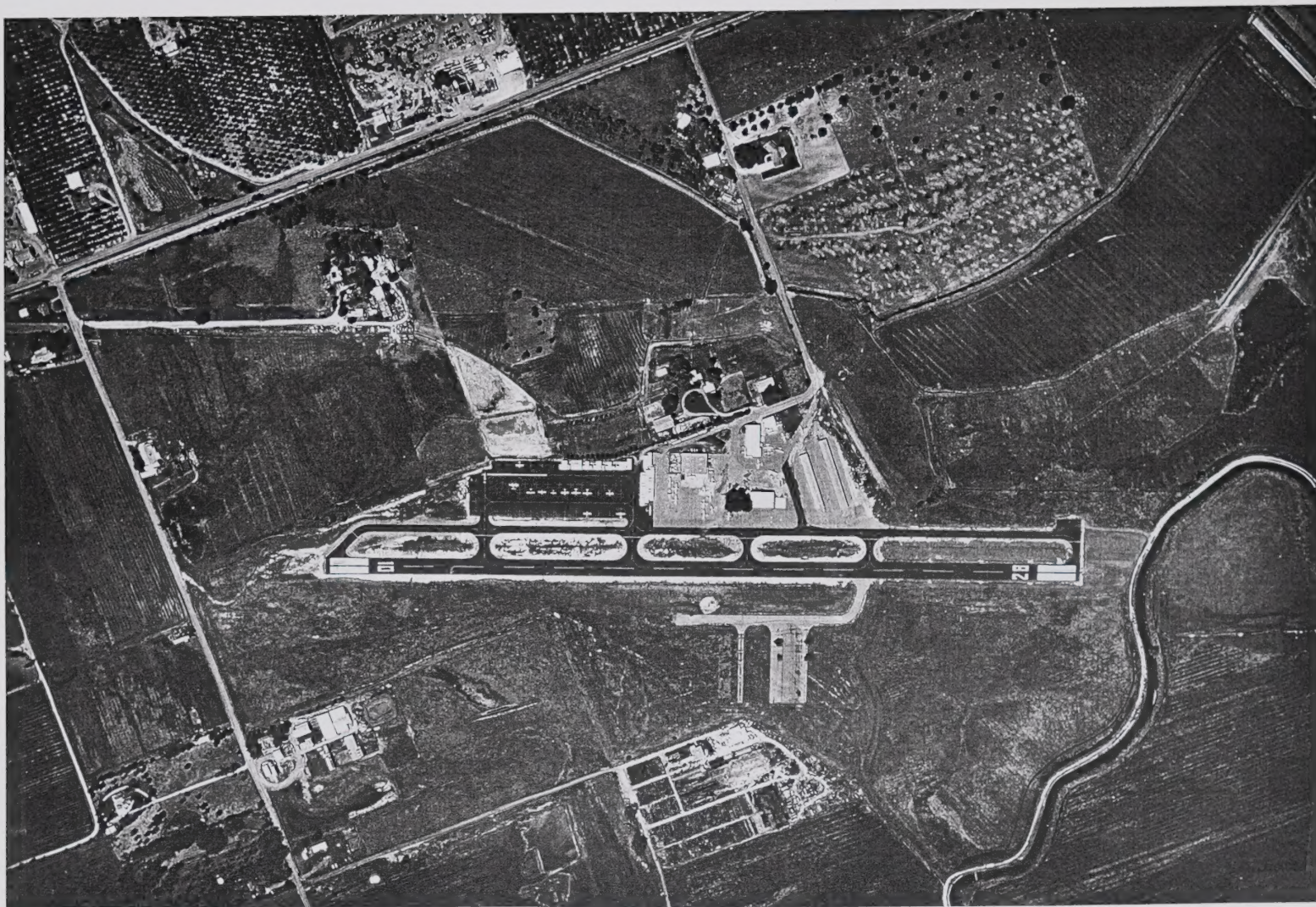
Runway 10-28 has medium intensity edge lights. Runway 10 has a Visual Approach Slope Indicator.

The runway, taxiway, and apron pavements are rated "good to excellent". Master plan calculation and analysis resulted in the estimated runway pavement gross weight strengths for aircraft with various landing gear configurations as follows:

Table 2
Pavement Strength
Oakdale Municipal Airport

<u>Runway</u>	<u>Single Wheel</u>	<u>Dual Wheel</u>
10-28	20,000 lbs	N/A

Source: Wadell Engineering Corporation



Runway Approaches and Obstructions

The existing approach slope ratios (horizontal:vertical) for each runway end are as follows:

Table 3
Runway Approach Slopes
Oakdale Municipal Airport

<u>Runway End</u>	<u>Approach Slope</u>
10	50:1
28	50:1

Source: FAA Airport Master Record #5010 for the Oakdale Municipal Airport, January 1994.

Terminal Area

The general aviation area, located north of the runway, consists of two fixed base operator (FBO) buildings and support areas including aprons, hangars, fueling facilities, and related activities. See Exhibit 3: Terminal Area Photomap.

In the terminal area, there are 18 T-hangar spaces and 12 portable hangar spaces. In addition, there is one large private unit hangar (60' by 90'), and two FBO hangars with offices approximately 80' by 100' and 50' by 120'.

Approximately 4.5 acres of aircraft parking apron accommodating 58 tiedown spaces are located in the terminal area.

Airspace/Navigational Facilities

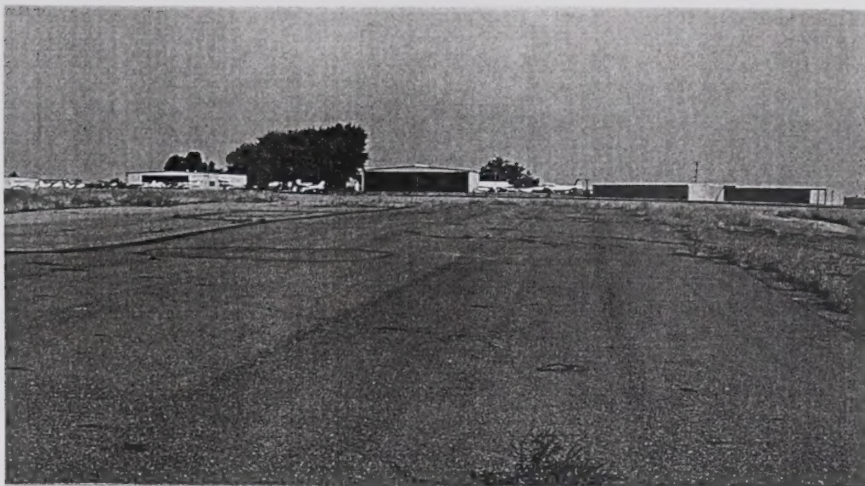
For visual approaches, the airport utilizes a standard left-hand pattern to both runway ends. The patterns altitude is set at 1,234 MSL (1,000 feet AGL).

The airport has one established nonprecision instrument approach procedure. The approach is "VOR Rwy 10", which utilizes the Manteca VOR. The minimums are 700 feet MDA with 1 mile visibility. All instrument approaches to Oakdale Municipal are handled by the FAA Approach Control facility at Stockton.

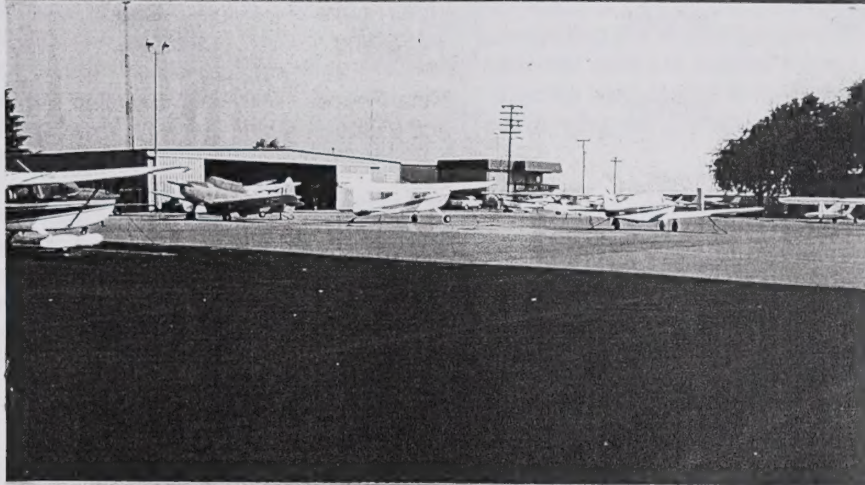
Off-Airport Land Use

The City of Oakdale occupies a four square mile area on the south side of the Stanislaus River. The urban pattern is compact and contiguous. The urban land uses in the city cover some 1,800 acres of developed land for residential, commercial, industrial, and public uses. Past growth of the city has occurred in an elongated band between the river and the railroad tracks.

The residential uses are located in four quadrants around the center of Oakdale. Large lot and estate residential extends to the east along the north side of Highway 120, and north of the Stanislaus River. Residential uses in the city occupy 712 acres, at an average of 7.8 dwelling units per acre.



TERMINAL AREA
FROM THE SOUTH
LOOKING ACROSS
THE RUNWAY



HANGARS AND
TIEDOWNS IN THE
TERMINAL AREA



TIEDOWNS IN THE
NORTHWEST OF THE
TERMINAL AREA



Table 4
Building Inventory
Oakdale Municipal Airport

<u>Building</u>	<u>Size</u>	<u>Construction</u>	<u>Condition</u>
Nine Unit East T-Hangars (City Owned)	31'x285'	Wood Frame/ Metal Siding	Fair
Seven Unit East T-Hangars (City Owned)	31'x225'	Wood Frame/ Metal Siding	Fair
Central FBO Hangar (City Owned)	80'x100'	Metal Frame and Siding	Good
Central FBO Hangar (Privately Owned)	50'x120'	Metal Frame and Siding	Excellent
Unit Hangar (Privately Owned)	34'x41'	Metal Frame and Siding	Good
Unit Hangar (Privately Owned)	60'x90'	Metal Frame and Siding	Good
Misc. Unit Hangars (Privately Owned)	13 each	Metal	Good
Mobile Home (Privately Owned)	24'x56'	Wood	Excellent
Two Unit Central T-Hangars (City Owned)	31'x65'	Wood Frame/ Metal Siding	Fair
Aircraft Wash Rack	40'x40'	Concrete	Good
City Fuel Farm	Two Tanks	Metal, Underground	Poor

Source: Wadell Engineering Corporation

Commercial uses are located in the central business district and along Yosemite Avenue and F Street, which intersect in the central business district. A majority of the industrial uses are located in the south section of the city, south of the railroad tracks, along Yosemite Avenue. Acreage of commercial and industrial land is relatively high (456 acres), due to the fact that Oakdale has two large industrial uses, Hershey Chocolate and Hunt-Wesson Foods.

Land uses outside the City of Oakdale boundaries consist primarily of agricultural uses and rural residences. In addition to farm residences as part of large agricultural tracts, there are rural ranchettes. Most adjacent lands are rural, consisting of grazing lands and, to a lesser degree, orchards and cultured fields. There are approximately 800 dwellings in the secondary area outside of the city boundaries.

The airport is located approximately two miles east of the current city boundaries of Oakdale. The site itself is owned by the City and constitutes an island of City property surrounded by land under County of Stanislaus jurisdiction. Land uses surrounding the airport are generally agricultural, with some rural residential uses. A few of these residential uses are located along Laughlin Road, the access road to the airport. An auto wrecking/scrap yard facility is located north of the airport along the north side of Sierra Road. The land surrounding the airport is currently zoned for agricultural uses.

The 1993 Oakdale General Plan designates the area north of the airport, north of Sierra Road, as one of three new residential development areas for the city. As well, the Plan proposes a commercial/office/conference area at the airport, between the airport site and Sierra Road, along with a possible municipal golf course located generally west of the airport site, which could connect with the conference center.

3. AVIATION FORECASTS

The aviation forecasts are prepared by first selecting and identifying the airport service area and its associated socioeconomic data, followed by analyzing aviation trends including aircraft activity and based aircraft. The activities commonly forecast for airport planning include passengers, aircraft operations, and based aircraft. In this plan, forecasts are projected through the year 2015.

Airport Service Area

The area served by Oakdale Municipal Airport is designated in this report as the airport service area. Geographical boundaries for airport service areas consist of a city, county, or other governmental subdivision because relevant population and economic data are readily available. Trends in aviation demand correspond with local growth trends in the governmental entity containing the main concentration of population served by an airport. Oakdale Municipal Airport is strategically located to serve general aviation demand in metropolitan Oakdale and the surrounding unincorporated parts of Stanislaus County. This area represents the airport service area for Oakdale Municipal Airport and is supported by information on population and economic data in that area, as well as the information on business and home locations of airport users.

Socioeconomic Data

Oakdale had a population of approximately 2,600 people in 1940. This grew to almost 6,600 people in 1970. Between 1970 and 1992 the average annual rate of growth was 3.1%. The population was approximately 8,500 in 1980 and almost 12,000 in 1990. By 1993, the Oakdale Draft General Plan indicated the population to be 13,586. Refer to Table 5. During the period between 1940 and 1990, Stanislaus County population grew from 74,866 to 376,100.

The 1993 Oakdale General Plan has used the city's annual average growth rate between 1980 and 1992, which was 3.5%, as the basis for projecting the future population of the city. The plan projects a population of 28,777 people by the year 2015. Refer to Table 5.

In terms of economic base, agriculture has been the primary economic activity in Stanislaus County for the past 100 years or more. Agricultural production in the county consists of livestock and poultry production, fruits and nuts, and field and vegetable crops. Manufacturing in the county is predominately in the areas of food processing/production. In Oakdale, Hershey Chocolate and Hunt-Wesson Foods are the two major industrial uses.

In the past, Stanislaus County was a low-cost labor market compared to other counties in the Bay Area and Central Valley. However, many newcomers to the Oakdale area and the County are of a different socioeconomic and cultural profile. A recent study conducted in concert with Pacific Gas and Electric Company titled "The Oakdale Business Climate Assessment and Target Industry Study (December 1991)" noted that newer residents tend to have higher expectations, skills, and educational and income levels than the native population of the Oakdale area.

The 1993 Oakdale General Plan (Draft Report, Volume I, October 1993) is designed to accommodate an ultimate population of 48,000 to 50,000 people. This growth would occur after the year 2015. The ultimate land use plan expands the city from four square miles to 18 square miles.

In addition, there are several proposed "new town" prospects in the vicinity of Oakdale. The new community of Riverbrook is located on the north side of the Stanislaus River across from the city of Riverbank. This 909-acre project will accommodate 1,987 dwelling units, a golf course and fifteen acres of commercial uses. The build-out population would be nearly 5,000 persons.

The proposed Village One community would occupy 1,800 acres (nearly three square miles) adjacent to Modesto. This development would result in an eventual population of 22,000, mostly in single family residences (with limited commercial uses). An industrial business park extends along the eastern edge of this proposed community.

Table 5
Historical and Projected Population Trends
Stanislaus County and City of Oakdale

<u>Year</u>	<u>Stanislaus County</u>	<u>City of Oakdale</u>
1940	74,866	2,592
1950	127,231	4,064
1960	157,294	4,980
1970	194,506	6,594
1980	---	8,474
1990	376,100	11,961
1993	---	13,586
Projected:		
1995	445,700 ^{1/}	--- ^{2/}
2000	502,300	17,176
2005	558,200	20,400
2010	---	24,229
2015	---	28,777

Sources: Historical: U.S. Department of Commerce, Bureau of the Census (1940-1990).
 Projections: ^{1/} California State Department of Finance, 1991.
 Projections: ^{2/} Oakdale City Draft General Plan, October 1993

Aviation Trends

General aviation flying can be divided into four major categories:

- **Business:** The use of an aircraft for executive or business transportation. This category includes (1) aircraft used by a corporation or other organization and operated by professional pilots to transport its employees/property (not for compensation or hire), and (2) aircraft used by an individual for transportation required by a business in which he is engaged.
- **Commercial:** The use of an aircraft for commercial purposes (other than the certificated air carriers) in three types of activity: (1) air taxi, involving any use of an aircraft by the holder of an air taxi operating certificate; (2) aerial application, such as the distribution of chemicals (cropdusting); and (3) industrial special, such as pipeline patrol survey, advertising, and photography.
- **Instructional:** The use of an aircraft for flight training under an instructor's supervision.
- **Personal:** The use of an aircraft for personal reasons similar to the utilization of an automobile.

At the outset of the forecasting process, it is important to recognize the overall impact of general aviation on the nation's economy and anticipated growth in general aviation through future years. FAA statistics of current activity and forecasts through 2006 identify a decreasing trend in general aviation growth. In 1993 there were 176,006 general aviation aircraft in the United States. Of these, 73.6% are piston powered aircraft, 2.6% rotorcraft, 2.5% turboprops, and 2.2% jets. Of the piston aircraft, 9.3% are twin engine. Based on owner reports, the use is as follows: 55% personal, 20% business, 5.5% executive, 7.2% instruction, 3.2% spraying, 2.1% observation, 0.6% other work, 0.8% commuter air carrier, 3.4% air taxi, 2.6% miscellaneous activities, and 22% inactive. The network of general aviation airports around the United States is the backbone of the nation's air transportation system.

General aviation includes a multitude of diverse and growing uses of aircraft, ranging from flying for sheer enjoyment to transportation of personnel by business firms in privately owned aircraft to highly specialized uses such as cropdusting, patrol, and aerial photography.

Historical and forecast growth of the national general aviation aircraft fleet by type of aircraft, as developed by the FAA, is set forth in Table 6. According to the FAA forecasts, the national general aviation fleet is expected to decrease from 176,000 aircraft in 1994 to 174,600 aircraft by 2006. Of these forecast aircraft, 79.3% are piston powered aircraft, 6.3% are turbine powered aircraft, and 3.6% are categorized as "other," which are not fixed or rotary wing. Of the piston aircraft, 9.1% are twin engine.

Table 6
National Active General Aviation Aircraft
by Type of Aircraft
FY 1990 - FY 2005
(In Thousands)

	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
Fixed Wing				
Piston				
Single Engine	158.7	128.1	122.4	122.4
Multi-Engine	21.4	16.2	15.6	15.9
Subtotal	<u>180.1</u>	<u>144.3</u>	<u>138.0</u>	<u>138.3</u>
Turbine				
Turboprop	5.2	4.5	5.2	5.7
Turbojet	4.0	4.0	4.7	5.2
Subtotal	<u>9.2</u>	<u>8.5</u>	<u>9.9</u>	<u>10.9</u>
Rotary Wing				
Piston	3.0	1.6	1.5	1.5
Turbine	4.0	3.0	3.5	4.0
Subtotal	<u>7.0</u>	<u>4.6</u>	<u>5.0</u>	<u>5.5</u>
Other	7.1	16.4	17.8	19.3
Total	203.4	173.8	170.7	174.0

Source: FAA Forecasts, Fiscal Years 1995-2006, March 1995

Aircraft Activity

General observation of the activity at Oakdale Municipal indicates that it is not particularly busy, except on summer weekends. However, as with most non-towered airports, aircraft operations have not been counted on any continuing basis.

It is estimated that 60% of current operations are local and 40% itinerant. Of these, approximately 4% of all operations were estimated to be by twin-engine aircraft and 0.5% by business jets. Thus, the vast majority of operations are by single-engine aircraft at Oakdale Municipal Airport.

Based Aircraft

Oakdale Municipal Airport serves Oakdale and adjacent county areas. This is demonstrated by the geographic distribution of the airport's based aircraft owners (determined by a list of their mailing addresses), as illustrated in Table 7. Some 35% of Oakdale aircraft owners (including fixed base operators) had Oakdale vicinity addresses. Approximately 44% were from other Stanislaus county locations. The number of aircraft based at Oakdale Municipal Airport has shown a continual increase over the years.

Table 7
Aircraft Owners by Location
Oakdale Municipal Airport

<u>Owner City</u>	<u>Percent</u>
Oakdale Vicinity	35
Other Stanislaus County	44
San Joaquin County	8
Tuolumne County	7
Alameda County	6

Source: Wadell Engineering Corporation Analysis of Airport Manager Records

An airport plan is primarily developed from aviation demand forecasts. The California Department of Transportation (CalTrans) and the FAA through the National Plan of Integrated Airports System (NPIAS) provide information. To receive federal aid, airports must be in the NPIAS. Forecasts of based aircraft and operations from the NPIAS show that by the year 1999 there will be 66 aircraft based at Oakdale and 47,000 total operations. The state forecasts, published by Caltrans, show 75 based aircraft and 48,641 total operations in the year 2005.

Regional and system level forecasts are not suitable for site specific planning purposes due to lack of detail; therefore, individual airport forecasts are performed during the master planning process. In forecasting, it is the number of based aircraft that "drives" a demand model. Factors which influence an aircraft owner's decision to base his aircraft are the location of the airport, the accessibility of the site, and the availability of facilities for the user.

Recognizing the character and nature of aviation facilities within Stanislaus County, the following developments should result with time:

- The growth of population in Stanislaus County in general and Oakdale in particular will increase aviation demand;
- The need for general aviation training, aircraft basing, and the impact of increased traffic at the Modesto Airport will result in increasing demand for airport development in the Oakdale area.

To prepare a based aircraft forecast, adjustments need to be made to the Caltrans ASP forecasts. To project future based aircraft at Oakdale, the current County population and the current Oakdale based aircraft value was used. Next, a weighted based aircraft growth rate was calculated, with the County growth having a weight of 79%, and the City of Oakdale rate having a weight of 21%. This is in proportion to the actual aircraft basing patterns in the City and County. A two percent growth rate limitation was set to reflect the decreasing trend in the FAA national forecasts.

Forecasting general aviation activity in the study area cannot be separated from other general aviation issues in the area. Activity at any airport is dependent upon development at other airports as well as capacity constraints and limitations. Oakdale Municipal Airport is oriented toward general aviation operations including business, pleasure, and industry travel.

At present, there is no scheduled air cargo service in operation at Oakdale, although bank courier cargo, personal, and business/industry cargo is moved in general aviation aircraft. Rail and truck transportation remain the primary means of transporting commodities. Air freight movement exists at Modesto, but remains at a low level. There are no plans for cargo shipments from Oakdale Airport at this time. The attractiveness for cargo service is limited due to lack of backhaul loads on the return trip and the existing runway length, which limits the payload of cargo and business aircraft.

Aviation Forecasts

For purposes of this study, forecasts were prepared for based aircraft and annual operations from 1995 through the year 2015. The forecast, as presented in Table 8 and Exhibit 4, provides detailed information concerning the determination of mix for runway capacity analyses, the types of based aircraft for future apron and hangar parking requirements, the number of instrument operations for determination of instrument approach capabilities and needs, and the aircraft operations by type for use in the airport noise analyses.

Single engine, multiple engine, and helicopter aircraft are identified in Table 8. It is expected that some business jet and turboprop aircraft would be based at Oakdale due to increasing business and industrial development.

The forecast of aircraft operations is by type of operation, type of aircraft, and type of user. The local aircraft movements include touch-and-go training activity as well as flights in the immediate airport environs. The remaining aircraft movements are classified as itinerant, which includes flights that have origins and/or destinations away from the airport.

The instrument operations noted in Table 8 include instrument approaches (when aircraft arrive at the airport under instrument conditions using navigational aids) and instrument departures, which are the primary portion of the instrument operations. Typically there are more instrument departures than instrument approaches at general aviation airports since the instrument approach is a

more precise operation and usually occurs when arriving at a destination where it is necessary to let down to the airfield through cloud conditions or fog. Instrument departures most often involve a climb-out from the airport during instrument conditions when visual flight rule conditions exist on top of the clouds. The airport experiences a significant level of instrument training flights, including many aircraft from other airports.

Table 8
Aircraft and Operations Forecast
Oakdale Municipal Airport
1995-2015

	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>
Based Aircraft:					
Single Engine	51	55	59	64	68
Multi Engine	3	3	4	4	5
Helicopter	0	0	1	1	2
Turboprop	1	2	2	3	3
Turbine	0	0	1	1	2
Total	<u>55</u>	<u>60</u>	<u>67</u>	<u>73</u>	<u>80</u>

Annual Aircraft Operations:

By Type of Operation					
Local	22,910	24,890	27,290	29,710	32,110
Itinerant	<u>13,750</u>	<u>14,940</u>	<u>16,370</u>	<u>17,820</u>	<u>19,270</u>
Total	<u>36,660</u>	<u>39,830</u>	<u>43,660</u>	<u>47,530</u>	<u>51,380</u>

By Type of Aircraft					
Single-Engine Prop.	34,430	37,130	39,830	43,200	45,900
Multi-Engine Prop.	1,350	1,350	1,800	1,800	2,250
Helicopter	10	10	260	260	510
Turboprop	660	1,100	1,140	1,600	1,660
Turbine	<u>210</u>	<u>240</u>	<u>630</u>	<u>670</u>	<u>1,060</u>
Total	<u>36,660</u>	<u>39,830</u>	<u>43,660</u>	<u>47,530</u>	<u>51,380</u>

By Type of User					
Military	0	0	0	0	0
General Aviation	<u>36,660</u>	<u>39,830</u>	<u>43,660</u>	<u>47,530</u>	<u>51,380</u>
Total	<u>36,660</u>	<u>39,830</u>	<u>43,660</u>	<u>47,530</u>	<u>51,380</u>

Aircraft Operations Distribution

Peak Month	5,500	5,970	6,550	7,130	7,710
Peak Week	1,380	1,490	1,640	1,780	1,930
Average Day of Peak Month	180	200	220	240	260
Peak Hour of Average Day of: Peak Month	27	30	33	36	39
Instrument Operations	1,380	1,490	1,640	1,780	1,930
Approaches	350	370	410	450	480

Source: Wadell Engineering Corporation

As of 6-14-94

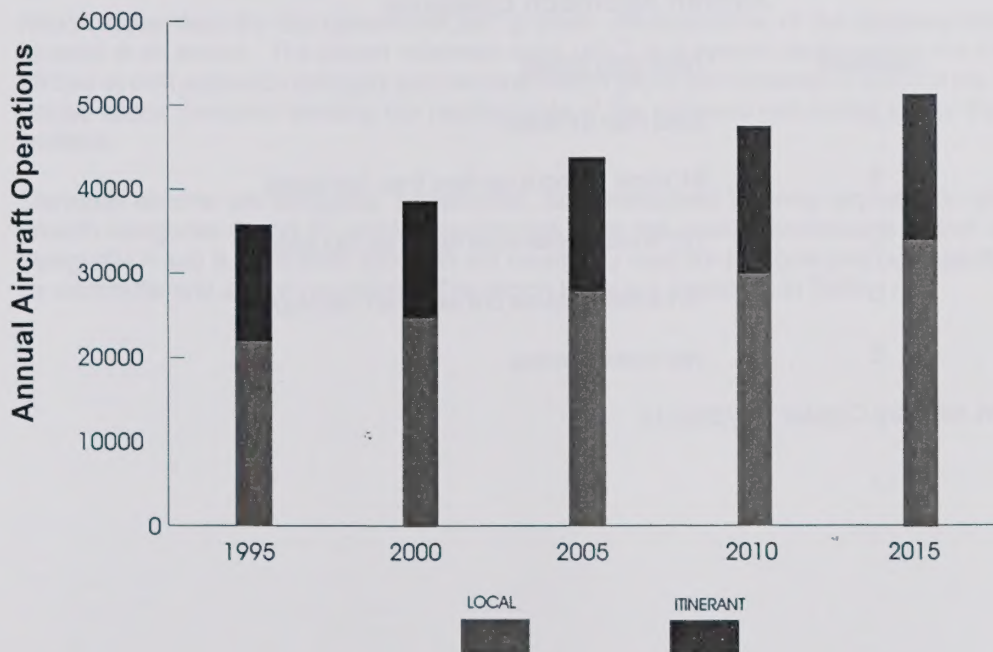
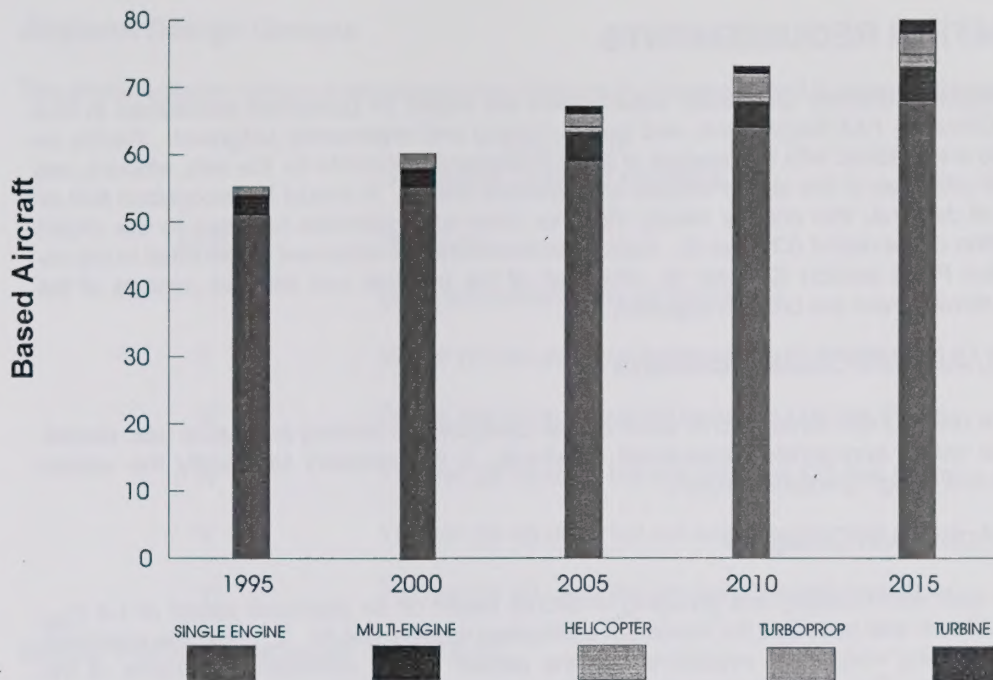


Exhibit 4
Aviation Forecasts
Oakdale Municipal Airport Master Plan

4. AVIATION REQUIREMENTS

Demand/capacity analysis and facility requirements are based on guidelines established in FAA Advisory Circulars, FAA Regulations, and good planning and engineering judgment. Facility requirements are matched with the forecast of aviation demand to provide for the safe, efficient, and convenient utilization of the airport without unreasonable delays. It should be recognized that on the basis of demand, this chapter merely identifies items and quantities for input to the Airport Plans section of the report (Chapter 5). Actual recommended development is identified in the Implementation Plans section (Chapter 6), where all of the physical and financial aspects of the proposed development are brought together.

Aircraft/Airport Classifications

Airports are planned and developed to serve certain categories of existing and future user aircraft. In order to select appropriate dimensional standards, it is necessary to identify the various categories and design groups of aircraft.

Aircraft Approach Category

An aircraft approach category is a grouping of aircraft based on an approach speed of $1.3 V_{SO}$. V_{SO} is the aircraft stall speed at the maximum certificated landing weight. V_{SO} and the maximum certificated landing weight are established for the aircraft by the certificating authority of the country of registry. The aircraft approach categories are presented in Table 9.

Table 9
Aircraft Approach Category

<u>Category</u>	<u>Approach Speed</u>
A	Less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

Source: FAA Advisory Circular 150/5300-13.

Airplane Design Groups

The airplane design groups table categorizes airplanes by wingspan and is presented below.

Table 10
Airplane Design Groups

<u>Group</u>	<u>Wingspan</u>
I	Up to but not including 49 feet (15 m)
II	49 feet (15 m) up to but not including 79 feet (24 m)
III	79 feet (24 m) up to but not including 118 feet (36 m)
IV	118 feet (36 m) up to but not including 171 feet (52 m)
V	171 feet (52 m) up to but not including 214 feet (65 m)
VI	214 feet (65 m) up to but not including 262 feet (80 m)

Source: FAA Advisory Circular 150/5300-13.

Airport Types

Airport types describe the operational and physical characteristics of the airplanes intended to operate at an airport. The airport reference code (ARC) is a system developed by the FAA which utilizes aircraft approach category and airplane design group components to assist in the design of critical airport elements meeting the requirements of the airplanes anticipated to use the aviation facilities.

Transport airports are designed, constructed, and maintained to serve airplanes in aircraft approach categories C and D, while utility airports serve the smaller airplanes in aircraft approach categories A and B. The latter airplanes are commonly used for personal and business flying, and for commuter and air taxi operations. The airport types are presented in Table 11.

Table 11
Airport Types

<u>Type</u>	<u>Description</u>
Basic Utility--Stage I	This type of airport serves about 75 percent of the single-engine and small twin-engine airplanes used for personal and business purposes. Precision approach operations are not usually anticipated. This airport is designed for small airplanes in airport reference code B-I.
Basic Utility--Stage II	This type of airport serves all the airplanes of Stage I, plus some small business and air taxi-type twin-engine airplanes. Precision approach operations are not usually anticipated. This airport is also designed for small airplanes in airport reference code B-I.
General Utility--Stage I	This type of airport serves all small airplanes. Precision approach operations are not usually anticipated. This airport is also designed for airplanes in airport reference code B-II.
General Utility--Stage II	This type of airport serves large airplanes in aircraft approach category A and B and usually has the capability for precision approach operations. This airport is normally designed for airplanes in airport reference code B-III.
Transport	This type of airport serves all large airplanes in aircraft approach categories C and D.

Source: FAA Advisory Circular 150/5300-13.

Airport Service Role

Oakdale Municipal Airport is classified in the NPIAS as a basic utility airport. It currently serves as a basic utility stage I airport predominantly serving aircraft with approach speeds up to but not including 121 knots (Category B). On occasion the airport receives transient business jet aircraft. The airport should be developed as a general utility stage II airport handling B-II aircraft.

Airfield Capacity

Airfield facilities were evaluated for their ability to satisfy forecast aviation demand at the airport. Hourly runway capacities and annual service volume were estimated. Hourly runway capacity is defined as the maximum number of aircraft operations that can take place in one hour for given conditions. Annual service volume is a measure of annual aircraft operations that can be used as a reference in preliminary airfield planning.

The aviation forecasts along with the 1995 operations levels were evaluated. The airfield layout and operational use was determined from the Airport Layout Drawing and observations of airfield operations.

Runway Use

Runway use encompasses the number, location, and orientation of active runways, as well as the directions and types of operations using each runway. Runway use depends primarily on wind direction and wind speed, but also depends on other factors such as air traffic control rules and noise abatement procedures, runway instrumentation, taxiing distance, and runway length. The annual use percentages were calculated based upon conversations with Airport management, available wind analysis, and observations of airfield use. It is estimated that Runway 10 is used 10% of the time, and Runway 28 is used 90% of the time.

Airspace and Air Traffic Control

Oakdale Municipal Airport has no on-airport nav aids, but uses the Manteca VOR. Current minima for straight-in landing are one mile visibility and 700 feet MSL decision height. Stockton approach control has been delegated responsibility for control of instrument flight rules (IFR) aircraft within this area. The overall airspace of Oakdale Municipal Airport and its neighboring airports is generally unrestricted.

It is assumed that current air traffic control procedures will continue throughout the planning period to 2015. Ongoing FAA research may lead to new standards in the future. The benefits from this research will be realized primarily under IFR conditions, which is an important factor at Oakdale Municipal Airport. The Oakdale Municipal Airport should preserve for a precision approach system with sites for a glide slope and localizer antenna for instrument descent enhancements. A global positioning system could also be installed. An FAA funded air traffic control tower is not expected to be commissioned during the planning period, since entry level traffic demand criteria must be over 200,000 annual operations.

Ceiling and Visibility Conditions

Ceiling and visibility have an important impact on airfield operations and runway capacity because spacing between aircraft is often less with high ceilings and good visibility than when conditions are less favorable. The two types of flight rules for specific weather conditions are visual flight rules (VFR) and instrument flight rules (IFR). The definitions of these conditions are:

- VFR: Ceiling is at least 1,000 feet and visibility is at least 3 miles
- IFR: Ceiling is below 1,000 feet and/or visibility is below 3 miles

There is no weather data to establish the percentage of VFR versus IFR conditions. It is assumed that VFR conditions occur approximately 90% of the time and IFR conditions occur approximately 10% of the time. It is seldom that IFR conditions continue throughout a full day. Low ceilings and fog usually dissipate by mid-day.

Aircraft Mix

Aircraft mix is composed of four aircraft classifications: A, B, C, and D. Class A includes small single-engine aircraft (weighing 12,500 pounds or less); Class B includes small twin-engine aircraft (weighing 12,500 pounds or less); Class C includes large aircraft weighing more than 12,500 pounds and up to 300,000 pounds; and Class D includes heavy aircraft weighing more than 300,000 pounds. No Class D and few class C aircraft utilize Oakdale Municipal Airport.

The following aircraft mix at the airport was derived from the aviation demand forecasts presented in Table 8. It was assumed that helicopters are negligible. All turboprop and turbine aircraft and multi-engine piston aircraft are assumed to be Class B. For this study, it is assumed that 50% of the Class A aircraft do not operate in IFR weather conditions and that all Class B aircraft will operate during IFR conditions.

Table 12
Aircraft Mix
Oakdale Municipal Airport

<u>Aircraft Class (VFR Conditions)</u>	<u>1995</u>	<u>2005</u>	<u>2015</u>
A	94	92	90
B	6	8	10
<u>Aircraft Class (IFR Conditions)</u>			
A	89	85	82
B	11	15	18

Source: Wadell Engineering Corporation

Hourly Runway Capacity

Hourly runway capacity is the maximum number of aircraft operations that can take place in one hour for given conditions. Factors that affect hourly runway capacity include:

- Runway use
- Airspace and air traffic control
- Ceiling and visibility conditions
- Aircraft mix

VFR peak hourly capacity at Oakdale Municipal Airport are dependent on the runway-use configuration actually utilized. IFR operations at Oakdale Municipal Airport only occur under a single runway-use configuration. Estimated hourly runway capacities, together with peak hour demand for the planning period, are as follows:

Table 13
Hourly Runway Capacity
Oakdale Municipal Airport

	<u>Planning Period</u>		
	<u>1995</u>	<u>2005</u>	<u>2015</u>
VFR peak hourly demand	27	33	39
VFR peak hourly capacity	100	100	100
IFR peak hourly demand	3	4	5
IFR peak hourly capacity	10	15	15

Source: Wadell Engineering Corporation

Under both VFR and IFR conditions, the hourly runway capacities are above peak hour demand through the 20-year planning period. It is assumed that IFR conditions occur approximately 10% of the year and do not continue over a long period of time.

Annual Service Volume

Annual service volume is based on hourly capacities for the airfield operating conditions that occur throughout the year and on monthly, daily, and hourly variations in aircraft operations.

The estimated annual service volume and the forecast annual demand levels are as follows:

Table 14
Annual Service Volume
Oakdale Municipal Airport

<u>Year</u>	<u>Annual Service Volume</u>	<u>Annual Demand</u>
1995	215,000	36,660
2005	215,000	43,660
2015	215,000	51,380

Source: Wadell Engineering Corporation

On the basis of the analyses of the existing airfield, it is concluded that Oakdale Municipal Airport capacity exceeds aviation demand throughout the planning period.

Facility Requirements

An airport is composed of major elements which contribute to its overall size and shape. The principal components include:

- AIRFIELD
 - Runways
 - Taxiways
 - Visual Aids/Lighting
- TERMINAL AREA
 - Airplane Parking and Tiedown
 - Buildings and Hangars
 - Roads and Auto Parking
 - Support Facilities
- AIRSPACE/NAVAIDS
- LAND AREA REQUIREMENTS

This section discusses the facilities required to accommodate the forecast aviation demand. Each of the major facility requirement categories noted above is described separately. The facility requirements are summarized in tabular form at the end of this chapter.

Airfield

The airfield requirements analysis is prepared to determine future needs for the runway, taxiway, and visual aids/lighting systems. These requirements relate the extent and type of development necessary to accommodate the forecast demand and the capacity required of the airfield system.

Runways

Analysis of the runway system involves a determination as to necessary runway length, strength, orientation, and markings.

Runway Length

Runway length is determined analytically by evaluating the elevation of the airport above mean sea level and the design temperature, which is the mean of the maximum temperature during the hottest month of the year. An assumed design elevation of 234' and a critical temperature of 97 degrees F was used to prepare the runway length requirements table.

The Transport or business jet runway length requirements are based on aircraft size and useful load carried. The 75 percent level of business jet fleet includes all business jets weighing up to 30,000 pounds, typically the smaller business jets. The 100 percent fleet includes the largest planes up to 69,000 pounds, such as the Gulfstream III.

Table 15
Runway Length and Strength Requirements
Oakdale Municipal Airport

<u>Airport Classification</u>	<u>Runway Length</u>	<u>Runway Strength*</u>
Existing Airport		
Runway 10-28	3,020 ft.	20,000 # S
Basic Utility Stage I	2,700 ft.	8,000 # S
Basic Utility Stage II	3,200 ft.	8,000 # S
General Utility Stage I	3,800 ft.	12,500 # S
General Utility Stage II	4,400 ft.	30,000 # S
Transport**		
75%/60%	5,500 ft.	30,000 # S
75%/90%	7,300 ft.	30,000 # S
100%/60%	5,800 ft.	60,000 # D
100%/90%	9,400 ft.	60,000 # D

* "S" is pounds of single wheel gear configuration load; "D" is pounds of dual wheel load.

** First percent is aircraft size within business jet fleet; second percent is amount of useful load carried.

Source: Wadell Engineering Corporation

Discussions with a number of FBOs and airport management indicate that the majority of activity involves single-engine aircraft and light twin-engine aircraft; but heavy twin-engine, turboprop, and business jet aircraft also utilize the airport facilities.

The existing 3,020 foot runway can handle only small general aviation aircraft. The existing runway can not handle even the lightest business jets with standard runway lengths. A runway extension to 4,400 feet total length will be needed to bring the airport to a general utility stage II standard. load.

Runway Strength

The runway strength is determined by the airport runway category and type of aircraft anticipated to operate at the airport. The runway pavement strengths of each runway adequately meets the standards required for the type of operation expected at the airport as shown in Table 15.

Runway Orientation

The configuration of the airport is determined by the number and orientation of the runways. The primary factors related to the number of runways required are airfield capacity and demand.

One of the primary factors influencing runway orientation is wind. FAA criteria for a utility airport specify that a crosswind runway is required if the primary runway is oriented so that the crosswind on it exceeds 12 miles per hour (10.5 knots) more than 5 percent of the time (thus providing less than 95 percent wind coverage). Where a single runway orientation does not provide this usability factor of at least 95 percent, the airport system should include a crosswind runway. For a business jet or transport type runway, the criteria is 15 miles per hour (13 knots).

The airport wind rose indicates that Runway 10-28 has 99% wind coverage on a 15 mph crosswind basis and 97.5% coverage on a 10 mph crosswind.

Runway/Taxiway Markings

For paved runways, white runway numbers and centerline stripes are recommended. Non-precision and precision runways have additional threshold and edge markings. Yellow taxiway markings along the centerline and a transverse holding line a specified distance from the runway centerline are recommended. The proper distances are found in the Airport Plans chapter.

Taxiways

The addition of taxiways increases the airport operational efficiency and the runway capacity potential. Exit taxiways should be located at frequent intervals along a runway to serve each type of aircraft operating under variable landing conditions. They should provide for a free flow of aircraft to a point where the aircraft is clear of the runway, thereby ensuring continuous flow and maximum capacity. The Range in Acceptable Exit Locations (Table 16) shows the range of acceptable exit locations by type of aircraft for various types of exits. Parallel taxiways are recommended to enhance airport operational flexibility efficiency. Based on the taxiway analysis, adequate exit taxiways are available on runway 10-28.

Table 16
Range in Acceptable Exit Locations
Distance from Threshold
Oakdale Municipal Airport

Exit Type	Existing Exit Locations		Range Usable by General Aviation Aircraft
	Runway 28	Runway 10	
Right Angle (90°)	850', 1325', 1800', 2400', 3000'	625', 1225', 1625', 2175', 3000'	1250' - 4400'
Angle (45°)	---	---	1050' - 3900'
High Speed (30°)	---	---	850' - 2400'

Source: Wadell Engineering Corporation

Visual Aids/Lighting

The following visual aids and lighting are considered to be the minimum necessary at a well-planned, public, general aviation airport:

- Basic runway markings
- Segmented circle
- Lighted wind cone
- Rotating beacon
- Medium Intensity Runway Lights (MIRL)
- Precision Approach Path Indicator System (PAPI)

In addition to the above visual aids and lighting, airports with precision or non-precision approaches and larger aircraft have some of the following:

- Runway End Identifier Lights (REIL)
- High Intensity Runway Lights (HIRL)
- Runway distance marker signs
- Approach light systems with sequence flashing lights
- Non-precision or precision runway markings

The Oakdale Municipal Airport has a non-precision runway with direct burial medium intensity edge lighting. Additions for Runway 10-28 include extension and placement in conduit for the runway edge lighting system, runway distance marker signs, and REIL for Runway 10, with baffles to prevent offensive light intrusion of neighboring properties. Additions to the lighting systems will be incorporated in the capital improvement program.

Terminal Area

Terminal area requirements include airplane parking and tiedown aprons, buildings and hangars, roads and auto parking. The Facility Requirements table at the end of this chapter presents the summary of necessary facilities.

Airplane Parking and Tiedown Aprons

The currently available apron tiedown positions are adequate to meet demand through the forecast period. However, continued review of these requirements is necessary to monitor any shifts or changes in demand characteristics. The west apron has "tail-to-tail" parking of aircraft. The central apron area configuration does not provide good parking and spacing for business jets and large multi-engine aircraft. These spaces should be "power-in and power-out" parking.

The facility requirements for airplane parking and tiedown aprons were determined by relating existing and planned apron tiedown positions with projected demand by aircraft type. The General Aviation Facilities Requirements Summary table (Table 19) identifies the demand for aircraft parking by type. Transient parking space requirements are based on projections of existing demand, recognizing an increase in business and visitor activity. Airplane parking and tiedown requirements have been estimated based on characteristics of local based tiedown demand. A waiting list for T-hangar parking exists at this airport. Some aircraft are currently parked on aprons, since hangars are not available for all users. Hence, future based aircraft tiedown space requirements reflect the assumption of hangar demand and the ability to satisfy hangar demands. If adequate hangar facilities are not available, the requirements for tiedown positions are expected to be larger than projected.

Table 17
Available Aircraft Parking Facilities
Oakdale Municipal Airport

<u>Facility</u>	<u>Available Spaces</u> <u>1994</u>
Tiedowns	
Transient	6
Based Tiedowns	<u>46</u>
	52
Hangars	
Unit Hangars	3
T-Hangars	17
Portable Hangars	<u>15</u>
	35
Total Spaces	87

Source: Wadell Engineering Corporation

Buildings and Hangars

The number of hangars depends upon local demand and climate. Presently, the number of hangar spaces available at the airport total 35 (see Table 17). Conversations with local airport representatives and responses from airport users indicate more hangar facilities are needed. The airport manager maintains a hangar waiting list. Currently 16 names are on the list. Hangar demand is estimated at 64 in 2015.

Fixed based operator lease areas, tiedowns, and hangars are revenue producing facilities. Their timely development is essential for growth of the airport and production of revenues to be used for matching funds. The positive revenue-generating benefits of these facilities will be derived if the facilities are built when sufficient demand exists, thereby assuring the success of the building development program.

Airport buildings should be constructed to fulfill specific needs. These needs include fixed based operator buildings providing repair and maintenance, air charter, shops, salesroom and administrative buildings accommodating the public including pilots, passengers, and visitors. The number of pilots and passengers in the terminal area is presented in Table 18. The activity is not large enough to require a terminal building. Pilots and passengers can use FBO lobbies and facilities.

Table 18
General Aviation Terminal Area Operational Factors
Oakdale Municipal Airport

	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>
Busy Hour Operations					
Local	17	19	21	23	24
Itinerant	10	11	12	14	15
Total	27	30	33	36	39
Busy Hour Pilots & Passengers					
Local	21	23	26	28	30
Itinerant	25	28	31	34	37
Total	46	52	57	62	67
Pilots and Passengers Within the Terminal Area	31	34	37	41	44

Source: Wadell Engineering Corporation.

Roads and Auto Parking

Access to the airport is important to meet demand levels. Automobile access and parking facilities required to serve projected demand have been based on busy hour pilot and passenger forecasts within the terminal area.

Airport access is provided by Laughlin Road, a roadway connected to Sierra Road. These roadways have sufficient capacity to accommodate airport generated vehicular traffic demands throughout the forecast period.

Presently there are 25 spaces available in the parking lots adjacent to the FBO buildings. Based on the forecasts, auto parking for the year 2015 is estimated to be 40 spaces (see Table 19).

Support Facilities

Support facilities for the airport include communications, fuel storage and distribution, electric power, water supplies, waste water disposal, and storm water collection and disposal. Availability of these facilities is essential to the operation of the airport. The extent and condition of these facilities are described in Chapter Five and in the Appendix.

Land Area Requirements

The initial step in any airport development is the determination of sufficient land to ensure that (1) the airport can accommodate the long term air traffic requirements, and (2) the land area contains airport operational areas under appropriate control to ensure compatibility of land use around the airport. The amount of land needed can vary considerably in size depending on landing area (e.g., length, number, and layout of runways and taxiways), approach areas (e.g., runway protection zones), and building area (e.g., T-hangars, aircraft tiedowns, buildings, auto parking). Specific land area requirements are subject to siting and layout and, therefore, are discussed in Chapter Five, Airport Plans.

The foregoing comments about facilities required during the planning period are direct input to the Airport Plans chapter and are used in developing physical layouts. Once the layouts are prepared, quantities and cost estimates for development are determined and presented in Chapter Six, Implementation Plans.

Airspace/Nav aids

Oakdale Municipal Airport is served by Victor airways that radiate from the Manteca and Rancho Murieta VORs, including V23, V109, and V113 (see Exhibit 5). These airways serve lower altitude enroute traffic. In addition, jet routes J65 and J189, which serve high altitude air traffic, pass adjacent to the airport.

There are no areas of restricted airspace in the Oakdale area.

Stockton approach control has responsibility for control of instrument flight rules (IFR) aircraft in the area. Generally, the overall airspace in the immediate Oakdale area is unrestricted.

As discussed previously, Oakdale currently has one published instrument approach which uses the Manteca VOR.

The addition of a localizer/DME approach system at the airport would enhance control and operation of aircraft, improve safety during instrument operations, and relieve Stockton approach controller workload. It would be useful as an area training facility, relieving Modesto and Stockton airports.

An analysis of existing nav aids serving Oakdale Municipal Airport was undertaken to assess the capability of these facilities to adequately serve future air traffic operations. Currently, the Airport has good navigational facilities. Runway 10 has a non-precision approach area using the Manteca VOR, but lacks a glide slope and localizer facility for precision approaches. An automated surface observation system (ASOS) is necessary for automatic weather reports since the airport does not have a tower or flight service station. Future lighting additions for Runway 10-28 include extensions to the medium intensity runway lights (MIRL), precision approach path indicators (PAPI), and runway end identifier lights (REIL).

Table 19
General Aviation Facility Requirements Summary
Oakdale Municipal Airport

	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>
Demand					
Based Aircraft	55	60	67	73	80
Aircraft Operations	36,660	39,830	43,660	47,480	51,380
Airfield Facilities					
Runways - Number	1	1	1	1	1
Longest Length (feet)	3,020	4,400	4,400	4,400	4,400
Width (feet)	66	75	75	75	75
Strength (pounds - single)	20,000	20,000	20,000	20,000	20,000
Terminal Facilities					
Airport Business Tenants	2	2	2	2	2
Acres	3.0	3.0	3.0	3.0	3.0
Auto Parking - Spaces	28	30	34	37	40
Acres	0.2	0.2	0.3	0.3	0.3
Hangars - Spaces	35	48	54	58	64
Acres	3.5	4.8	5.4	5.8	6.4
Open Tiedown Spaces					
Based	20	12	13	15	16
Transient	7	7	8	9	10
Open Tiedown Acres					
Based	1	1	1	1	1
Transient	1	1	1	1	1
Total Terminal Area Acres	9.6	10.0	10.7	11.1	11.7
Access					
Access Road Lanes	2	2	2	2	2
Daily Vehicle Trips	165	180	201	219	240
Peak Hour Trips	18	20	22	24	26

Note: Acreage requirements will vary depending on specific layout and geometrics.

Source: Wadell Engineering Corporation



5. AIRPORT PLANS

The Airport Plans represent the end-result of considering alternative configurations of facilities, particularly the establishment of nav aids, the location and alignment of T-hangars, the aircraft parking aprons, and the construction of the runway and taxiway system. Incorporated in the Airport Plans are the recommended development items for the three major airport components: the airfield, the airport terminal area, and the access and parking system. Chapter 6, Implementation Plans, discusses the stage development program for these airport improvements, as well as their cost and the economic/financial impacts of undertaking their development.

The specific objectives of the Airport Plans are to provide:

- A safe airfield system with adequate runway length, strength, and clearances for small business jets and general utility stage II aircraft use.
- Terminal facilities for general aviation aircraft, pilots, and passengers with adequate and convenient aircraft basing area, buildings, auto parking, and access.
- A flexible development plan with space and use relationships that will enhance service and provide user and community benefits.
- An economical plan that will provide suitable facilities and generate revenues necessary for proper operation, management and development of the airport.

The Airport Plans for the Oakdale Municipal Airport have been prepared (1) in a simplified graphic format (as presented in this chapter), and (2) in a more detailed technical graphic format (as presented in the Appendix). The corresponding graphics are as follows:

SIMPLIFIED FORMAT	TECHNICAL FORMAT
Airfield Area Plan	Airport Layout Drawing
Airspace Protection Plan	Airport Airspace Drawing Runway Protection Zone Drawing
Terminal Area Plan	Terminal Area Drawing

The technical graphic format has been prepared to meet FAA requirements for processing and approving final master plan drawings.

The appendix includes narrative and exhibits for the following special analyses:

Pavement Plan
Utilities Plan
Airport Property Map

Airfield Area Plan

The Airfield Area Plan depicts the airfield system in the simplified format (see Exhibit 6). It includes the runways, taxiways, lighting, on-airport nav aids, and the runway protection zones. The detailed technical format is the Airport Layout Drawing, located in the Appendix.

LEGEND

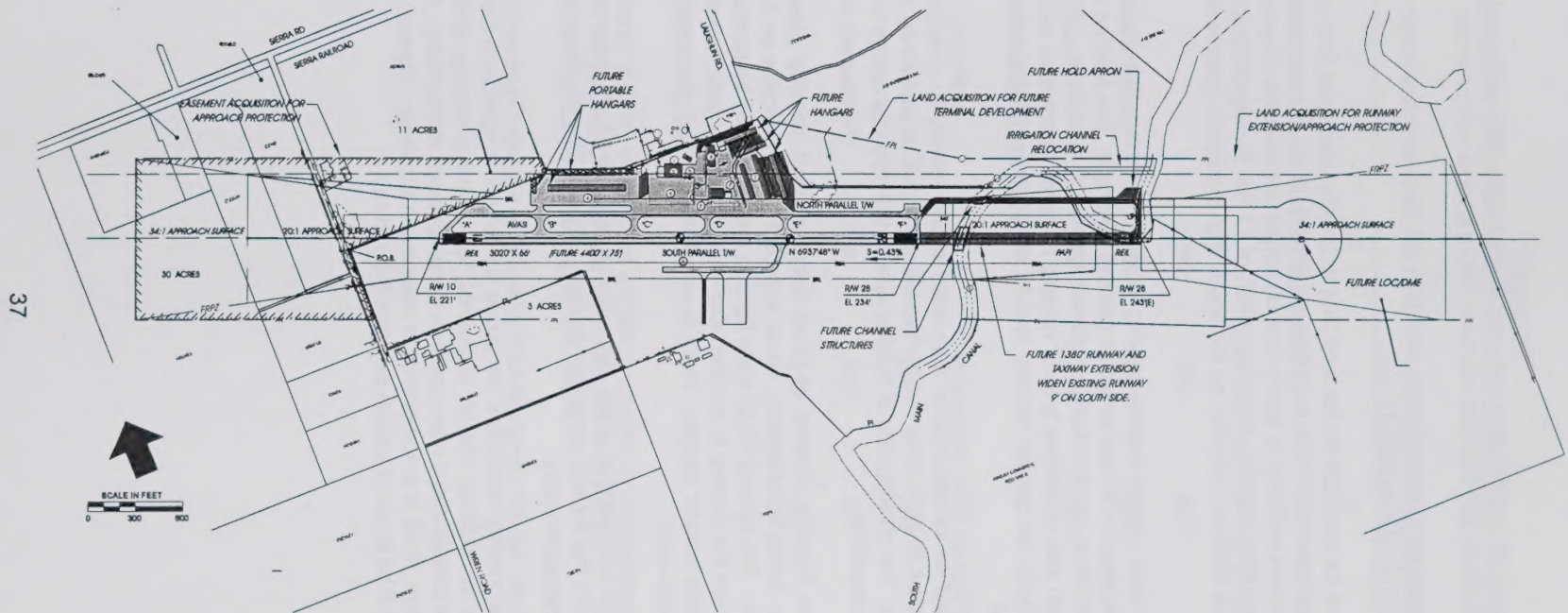
AIRFIELD PAVEMENTS

BUILDINGS

ROAD / PARKING

EXISTING

FUTURE



WADELL ENGINEERING CORPORATION

Exhibit 6 Airfield Area Plan Oakdale Municipal Airport Master Plan

The existing runway 10-28, is 3,020 feet long and 66 feet wide. The width is six feet wider than a basic utility stage II runway, and nine feet narrower than a general utility runway.

The runway is adequate for basic utility use, but does not have sufficient length for small business jets when carrying any significant useful loads.

Runway 10-28 cannot be extended to the west due to terrain, residential land uses, and property constraints. It can be extended to the east through pasture lands. An extension of 1,380 feet will enhance noise abatement and help to satisfy take off length requirements of smaller turbine aircraft and all other general utility aircraft. A runway width of 75 feet is necessary for future standards. The runway should be widened nine feet on the south side to achieve greater separation from the parallel taxiway.

The existing 25-foot wide parallel taxiway serving Runway 10-28 is adequate in width for current use, but should be widened to 35 feet for future general utility use. The existing taxiway is 150 feet from the runway centerline, substandard for current and future conditions. Any future widening should be on the north side to achieve greater runway to taxiway centerline separation. Upon extension of runway 10-28, the parallel taxiway should be extended 35 feet wide with a centerline separation of 240 feet.

Holding aprons should be constructed at both ends of the runway to provide an area clear of taxiway traffic for aircraft to park while the "before-takeoff-check" is performed and IFR departure clearance is obtained. The construction of holding aprons will minimize delays to departing aircraft by providing bypass capability.

The airfield lighting at Oakdale consists of direct burial medium intensity runway edge lighting, taxiway edge lighting, apron flood lighting, visual approach slope indicator on Runway 10 (VASI), and a rotating beacon. The runway 10-28 edge lighting system should be replaced and put in underground conduit when the runway is widened and extended to the east. Apron flood lighting is installed on the centrally located hangar. There is also floodlighting in the apron area. Additional floodlighting will be necessary.

The plan calls for a new PAPI located at the east end of runway 10-28. Runway end identifier lights should be installed with the runway extension project. The addition of distance remaining signs will enhance aircraft operation safety.

Table 20 indicates the runway separation standards for aircraft in approach categories A and B. Table 21 and Table 22 indicate design standards for runways serving aircraft in approach categories A and B for precision and non-precision visual runways, respectively. As discussed previously, existing runway 10-28 is a non-precision category A-I runway. Runway 10-28, when extended in the future, will be a non-precision category B-II runway.

Table 20
Runway Separation Standards for Aircraft Approach Categories A & B

ITEM	AIRPLANE DESIGN GROUP				
	I*	I	II	III	IV
Nonprecision Instrument and Visual Runway Centerline to:					
Parallel Runway Centerline	Varies from 700' VFR up to 4300' + IFR				
Hold Line**	125'	200'	200'	200'	250'
Taxiway/Taxilane Centerline**	150'	225'	240'	300'	400'
Aircraft Parking Area	125'	200'	250'	400'	500'
Precision Instrument Runway Centerline to:					
Parallel Runway Centerline	Varies from 1000' up to 4300' +				
Hold Line**	175'	250'	250'	250'	250'
Taxiway/Taxilane Centerline**	200'	250'	300'	350'	400'
Aircraft Parking Area	400'	400'	400'	400'	500'

* Facilities for only small airplanes.

** No part of an aircraft (tail tip, wing tip) at a holding location or on a taxiway centerline can be within the runway safety area or penetrate the obstacle free zone (OFZ). An increase to these separation distances may be needed at higher elevations.

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 21
Precision Instrument Runway Design Standards
for Aircraft Approach Categories A & B

ITEM	AIRPLANE DESIGN GROUP				
	I*	I	II	III	IV
Runway Length	(Varies--See Aircraft Flight Manuals)				
Runway Width	75'	100'	100'	100'	150'
Runway Shoulder Width	10'	10'	10'	20'	25'
Runway Blast Pad Width	95'	120'	120'	140'	200'
Runway Blast Pad Length	60'	100'	150'	200'	200'
Runway Safety Area Width	300'	300'	300'	400'	500'
Runway Safety Area Length Beyond RW End**	600'	600'	600'	800'	1,000'
Runway Object Free Area Width	800'	800'	800'	800'	800'
Runway Object Free Area Length Beyond RW End**	1,000'	1,000'	1,000'	1,000'	1,000'
Runway Obstacle Free Zone Width and Length	(length = runway length + 400'; width varies from 120' to 400')				

* These dimensional standards pertain to facilities for only small airplanes.

** The runway safety area and runway object free area lengths begin at each runway end. With the declared distance concept, these lengths begin at the stop end of each ASDA and both ends of each LDA, whichever is greater.

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 22
Nonprecision Instrument and Visual Runway Design Standards
for Aircraft Approach Categories A & B

ITEM	AIRPLANE DESIGN GROUP				
	I*	I	II	III	IV
Runway Length	(Varies--See Aircraft Flight Manuals)				
Runway Width	60'	60'	75'	100'	150'
Runway Shoulder Width	10'	10'	10'	20'	25'
Runway Blast Pad Width	80'	80'	95'	140'	200'
Runway Blast Pad Length	60'	100'	150'	200'	200'
Runway Safety Area Width	120'	120'	150'	300'	500'
Runway Safety Area Length Beyond RW End**	240'	240'	300'	600'	1,000'
Runway Object Free Area Width	250'	400'	500'	800'	800'
Runway Object Free Area Length Beyond RW End**	300'	500'	600'	1,000'	1,000'
Runway Obstacle Free Zone Width and Length	(length = runway length + 400'; width varies from 120' to 400')				

* Facilities for only small airplanes.

** The runway safety area and runway object free area lengths begin at each runway end. With the declared distance concept, these lengths begin at the stop end of each ASDA and both ends of each LDA, whichever is greater.

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 23 identifies the runway setback requirements selected and in use for the Oakdale Municipal Airport. These requirements have been adjusted to properly accommodate the layout and development of the runway and taxiway system and adjacent aircraft parking and building areas. The criteria identified in Table 23 meet or exceed the FAA standards presented in the previous tables. Runway setback requirements are indicated on the Airport Layout Drawing. For Oakdale Municipal Airport, the runway safety area (RSA) is centered on the runway and has a width of 300 feet to protect for conversion of the runway to "precision" beyond the planning period. In this area, no object may penetrate the volume of space above this zone except for necessary lighting and frangible-mounted nav aids.

The building restriction line (BRL) defines the closest point to the runway that any building may be constructed. The minimum BRL is 250 feet each side of runway 10-28 and includes the runway protection zones. In practice, a building's height must also be considered before siting its location, and the requirements of Federal Aviation Regulations Part 77 satisfied regarding obstructions to navigable airspace. The BRL is designed to not only meet BRL requirements, but also prevent buildings or permanent objects from being placed inside the ROFA and RVZ. Furthermore, the BRL is set back far enough to prevent aircraft operational aprons from being blocked by unintentional placement of structures.

The runway obstacle free area (ROFA) is also shown. The following table summarizes the setback requirements for the runways.

Table 23
Runway Setback Requirements
Oakdale Municipal Airport

<u>Runway</u>	<u>Lateral Distance from Runway CL</u>		
	<u>BRL</u>	<u>RSA</u>	<u>ROFA</u>
10-28	250'	150'	250'

Source: Wadell Engineering Corporation

The Airport Layout Drawing shows the future fencing program necessary for proper operations of the airport. The purpose of a properly prepared fencing program is to minimize hazards to pedestrians and ground vehicles by separating them from aircraft as a safety measure. Furthermore, fencing allows for better definition of airport property and areas under lease to airport tenants. The fencing as shown on the layout drawings generally reflects perimeter fencing of the airport property, but also identifies fencing necessary in the terminal areas to separate aeronautical from ground base activities. In addition, fencing should be provided to keep out non-airport activities unless a suitable lease agreement and ingress/egress permit is established. Additional access control gates are shown on the plan.

Airspace Protection Plan

An Airspace Protection Plan in simplified format was prepared for the Oakdale Municipal Airport (see Exhibit 7). This supplements the Airfield Area Plan and provides plan view information for the runway approach areas. The corresponding technical presentation of the airspace is presented on the Airport Airspace Drawing and Runway Protection Zone Drawing in the Appendix of this report.

-  PRIMARY SURFACE
-  TRANSITIONAL SURFACE (7:1)
-  APPROACH SURFACE
-  HORIZONTAL SURFACE
-  CONICAL SURFACE (20:1)

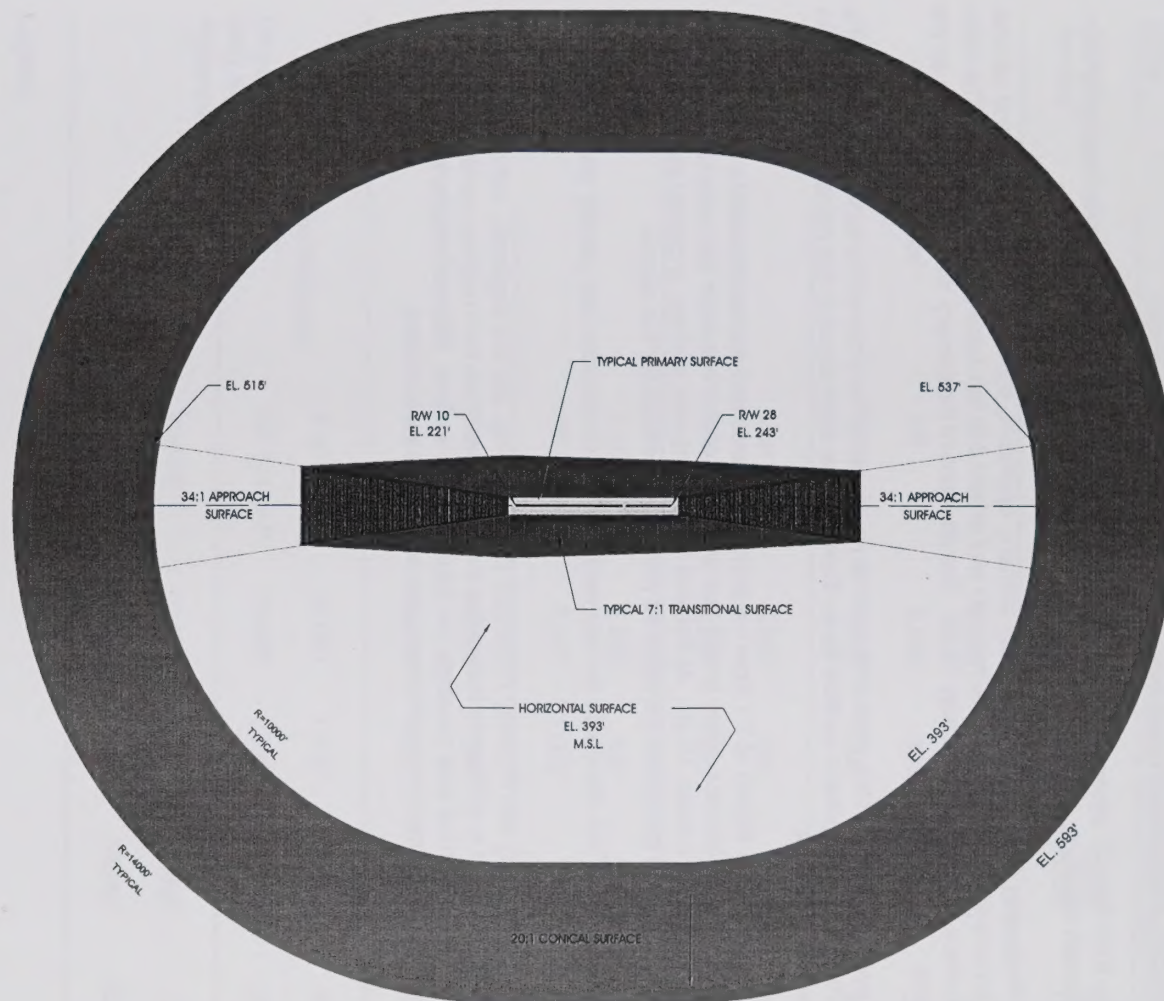


Exhibit 7

Approach Surface

Oakdale Municipal Airport Master Plan



A key function of these drawings is (1) to provide a basis for height zoning in the airport environs, and (2) to identify obstructions in the vicinity of the airport which may have an impact on the use of the runways and adjacent airspace. The drawings are prepared using criteria contained in Federal Aviation Regulations, Part 77, "Objects Affecting Navigable Airspace."

At Oakdale, the FAR Part 77 dimensional standards applied for runway 10-28 are those relating to "non-precision" instrument runways.

The Airspace Protection Plan shows imaginary primary, approach, transitional, horizontal, and conical surfaces. The primary surfaces surround the runways and extend 200 feet beyond the thresholds. The width of the primary surface is 500 feet for Runway 10-28. The elevation of the primary surface is the same as the runway centerline.

The approach surfaces rise from the ends of the primary surfaces. The slope of the surface is 34:1 with a length of 10,000 feet. The approach surface flares from an inner width equal to the primary surface to an outer width equal to 3,500 feet.

The transitional surfaces are sloped at 7:1 from the primary surfaces and approaches until intersecting the horizontal surface. The horizontal surface is 150 feet above the airport elevation and extends 10,000 feet from the primary surface of runway 10-28. At the limit of the horizontal surface, a conical surface of 20:1 slope and a 4,000 foot width completes the required protection surfaces for this airport.

Tables 24 and 25 present FAA standards for approach surface dimensions and runway protection zone dimensions.

The Airport Airspace Drawing and Runway Protection Zone Drawing, see the Appendix, indicates that the terrain surrounding the airport is sufficiently low so that it does not penetrate the imaginary surfaces. Existing buildings and trees in the terminal area penetrate the future primary surface. This will require either a waiver from the FAA or relocation if improved instrument approaches are implemented.

Table 24
Approach Surface Dimensions

ITEM	RUNWAY END		APPROACH SURFACE DIMENSIONS			
Airports Serving:	Approach End	Opposite End	Surface Length	Inner Width	Outer Width	Slope (H/V)
Small Airplanes Only	Visual	V	5,000'	250'	1,250'	20:1
		NP	5,000'	500'	1,250'	20:1
		NP 3/4 or P	5,000'	1,000'	1,250'	20:1
	Non-Precision	V or NP	5,000'	500'	2,000'	20:1
		NP 3/4 or P	5,000'	1,000'	2,000'	20:1
Large Airplanes	Visual	V or NP	5,000'	500'	1,500'	20:1
		NP 3/4 or P	5,000'	1,000'	1,500'	20:1
	Non-Precision	V or NP	10,000'	500'	3,500'	34:1
		NP 3/4 or P	10,000'	1,000'	3,500'	34:1
Large or Only Small Airplanes	Non-Precision 3/4	V or NP	10,000'	1,000'	4,000'	34:1
		NP 3/4 or P	10,000'	1,000'	4,000'	34:1
	Precision	V or NP	10,000'	1,000'	4,000'	50:1
		NP 3/4 or P	50,000'	1,000'	16,000'	50:1/40:1

Legend:

V = Visual Approach
NP = Nonprecision instrument approach with visibility minimums more than 3/4 statute mile
NP 3/4 = Nonprecision instrument approach with visibility minimums as low as 3/4 statute mile
P = Precision instrument approach

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 25
Runway Protection Zone (RPZ) Dimensions

ITEM	RUNWAY END		DIMENSIONS FOR APPROACH END			
Airports Serving:	Approach End	Opposite End	Zone Length	Inner Width	Outer Width	RPZ (acres)
Small Airplanes Only	Visual	V	1,000'	250'	450'	8.035
		NP	1,000'	500'	650'	13.200
		NP 3/4 or P	1,000'	1,000'	1,050'	23.542
	Non-Precision	V or NP	1,000'	500'	800'	14.922
		NP 3/4 or P	1,000'	1,000'	1,200'	25.252
Large Airplanes	Visual	V or NP	1,000'	500'	700'	13.770
		NP 3/4 or P	1,000'	1,000'	1,100'	24.105
	Non-Precision	V or NP	1,700'	500'	1,010'	29.465
		NP 3/4 or P	1,700'	1,000'	1,425'	47.320
	Large or Only Small Airplanes	Non-Precision 3/4	V or NP	1,700'	1,000'	1,510'
NP 3/4 or P			1,700'	1,000'	1,510'	48.978
Precision		V or NP	2,500'	1,000'	1,750'	78.914
		NP 3/4 or P	2,500'	1,000'	1,750'	78.914

Legend:

V = Visual Approach
NP = Nonprecision instrument approach with visibility minimums more than 3/4 statute mile
NP 3/4 = Nonprecision instrument approach with visibility minimums as low as 3/4 statute mile
P = Precision instrument approach

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Terminal Area Plan

The Terminal Area Plan, see Exhibit 8, was prepared after completion of the Forecast, Demand/Capacity Analysis, and Facility Requirements section of this report. The plan was developed simultaneously with the Airfield Plan to assure workability within the total plan, as well as appropriate integration in the staging process. An effort was made to achieve balance between operating convenience and efficiency with facility cost.

The terminal area includes the aircraft parking aprons, T-hangar areas, FBO areas, terminal building, fueling facilities, and other aviation-related facilities and services. Some considerations in development of the terminal plan are:

- Proper use of existing facilities
- Proximity of utilities
- Auto access and circulation
- Impacts on surrounding land uses
- Operating efficiencies and safety
- Development costs
- Business viability
- Passenger convenience and comfort
- Aircraft operational requirements
- Flexibility for future change

The existing terminal area apron at Oakdale consist of approximately 4.5 acres of pavement with a capacity of 52 tiedown spaces. A breakdown of this apron area shows that 6 spaces are located on the ramp in front of the central FBO hangar. Forty-six additional aircraft parking spaces are on the west apron.

The present pattern for aircraft parking is for transient aircraft to park in areas nearest the terminal building. The aircraft parking is of the "power-in, power-out" type to provide convenient and efficient maneuvering of aircraft. Based aircraft parking is "tail-to-tail" to allow optimum spacing commensurate with apron size and construction costs.

The existing 52 aircraft parking spaces are adequate to serve the existing terminal area through the year 2015. If additional hangar facilities are not provided, there will be a greater demand for tiedown spaces, yet space is available.

There is a continuing need for hangar space at Oakdale Municipal Airport. The existing 35 hangar spaces do not satisfy the current demand. Future T-hangars are proposed for the area east of the current hangar area, and on the northside of the westerly apron.

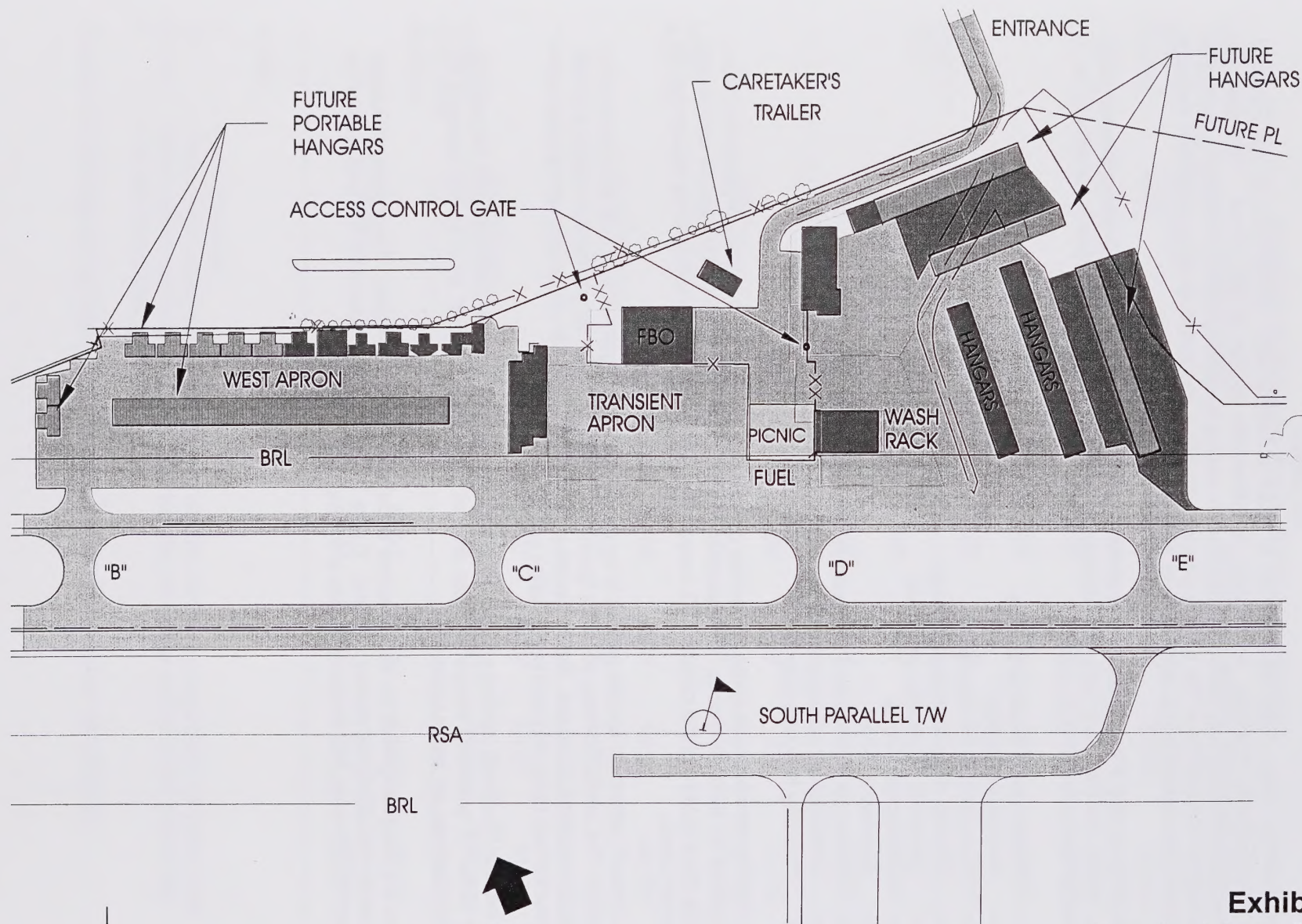


Exhibit 8
Terminal Area Plan
Oakdale Municipal Airport Master Plan

There are sufficient FBO facilities currently, and throughout the planning period. Additional FBO's will only reduce the number of based aircraft per FBO, resulting in down sizing and lesser service by each FBO in order to operate economically.

The present two FBO buildings with lobby areas are more than adequate to satisfy the current and future needs of the airport. The functions served in these areas include public waiting area for general aviation pilots and passengers, flight planning, sales of aviation materials, and snacks.

The Oakdale Municipal Airport has off-site fire protection by the City fire department. The airport's fire protection system includes ground level fire water storage tanks with pumping system. This system is connected to a network of fire hydrants in the terminal area.

The fire protection which is now available for the airport is adequate throughout the planning period. Since no air carrier activities are expected, it is not required that the City provide an aircraft rescue and fire fighting facility (ARFF). The City could acquire an on-airport pickup truck loaded with a purple K fire system as an added measure of safety.

Access Plan

Oakdale Municipal Airport is located about two miles east of the Oakdale city limit along two lane Sierra Road. Access to the airport is via Laughlin Road from Sierra Road. Although two miles east of the city limits of Oakdale, the airport site itself is in a separate precinct owned by the City. Airport access is considered good since the airport is far enough from the more urban areas for compatibility, yet close enough for convenient ground access.

There are two automatic controlled access gates to the terminal facilities, one near the west T-hangar and apron area, and the other near the central FBO hangar. Only authorized parties have access.

Presently, there are approximately 25 spaces for auto parking in the terminal area. The forecast need for future auto parking totals 40 spaces. There is ample area for additional auto parking, both in the existing areas and in the apron and hangar areas. Aircraft owners should be allowed to park their vehicles adjacent to the apron and hangar areas to provide convenient access, allow security for their parked vehicle while out of town, and to reduce the need to construct additional perimeter parking areas. The construction of additional parking should be planned to coincide with demand as it occurs.

Land Use Plan

Land use planning, both on and off the airport, is essential for establishing appropriate development areas on the airport and determining suitable and compatible uses for off-airport land development. A land use plan provides goals and objectives relating to protection and utilization of the land resources, development consistent with the needs and service levels of the community, and constraints to development based upon the local conditions. General adherence to land use plans, their goals, and their objectives will permit the orderly development of an airport and the surrounding area.

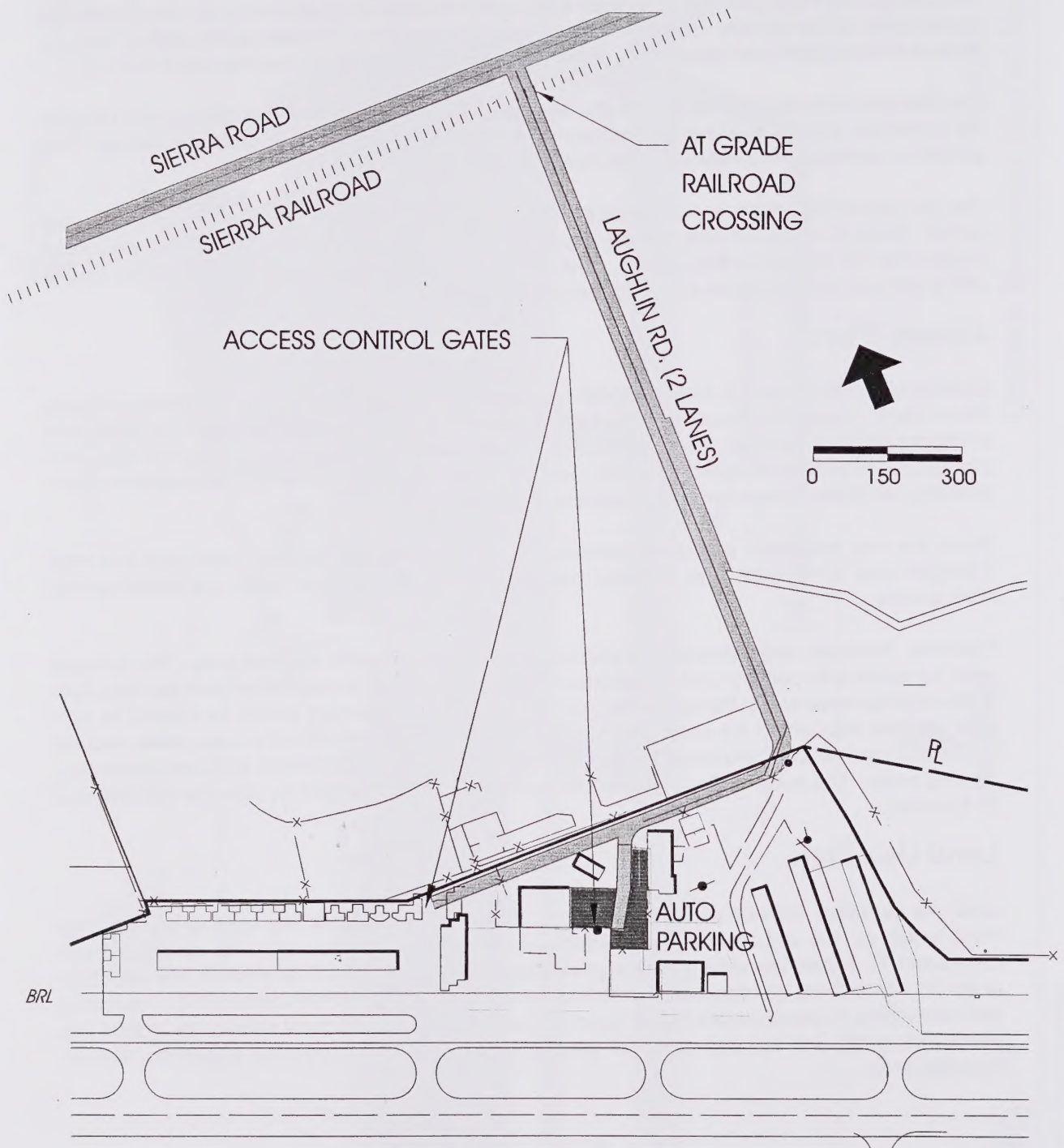


Exhibit 9
Access Plan
Oakdale Municipal Airport Master Plan

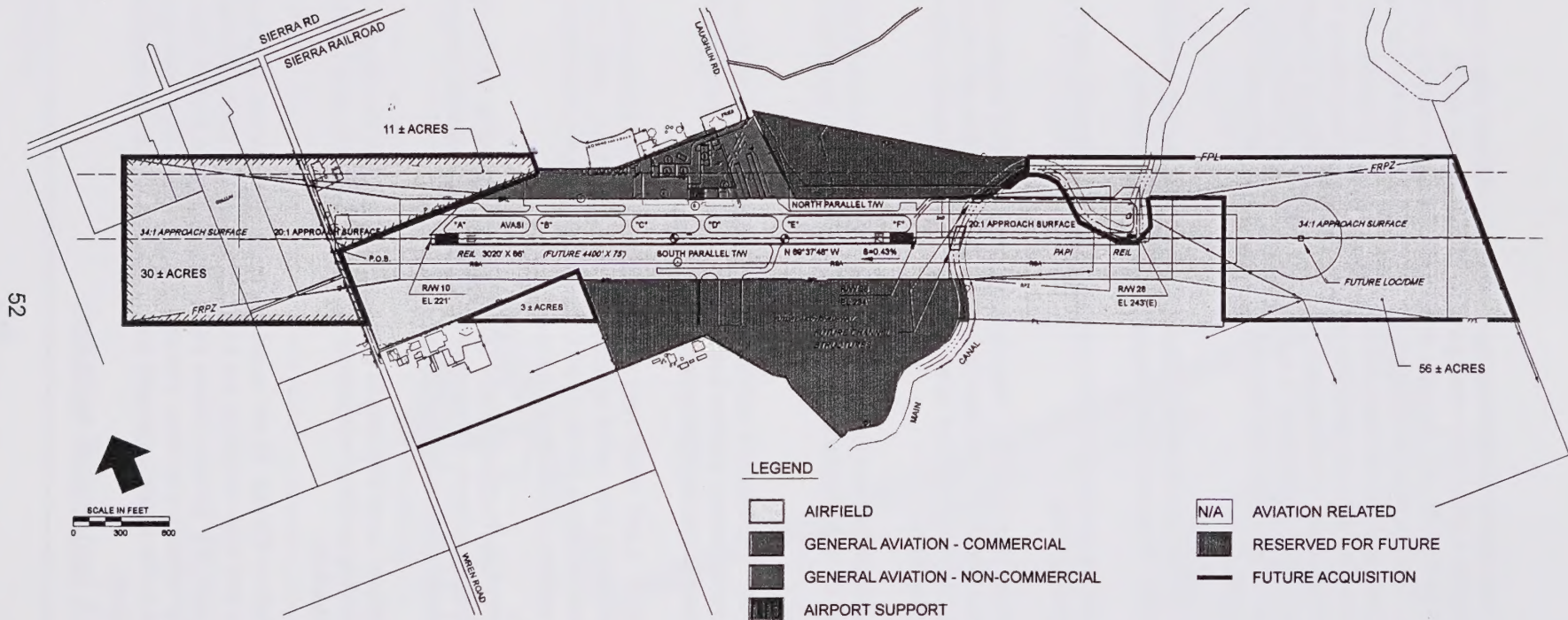
On-Airport

Identifying existing and recommended land uses within the ultimate airport boundary is necessary to provide the adequate control and management of the airport facility. The future land uses depicted in an on-airport land use plan are developed through analysis of the specific aviation needs of the airport. The development of land use plans for an airport can ensure the compatibility among the airport users and the efficient development of airport property. An on-airport land use plan is intended to serve as a broad guideline to assist in fulfilling the primary aviation needs of the airport. As future needs arise, an airport can apply the provisions of the master plan and its land use plan to each phase of development. If necessary, consideration should be given to determine the need to revise the master plan and land use plan as more information regarding actual airport use becomes available.

For the purposes of the Oakdale Municipal Airport Master Plan, several on-airport land use designations have been defined. These land use categories include the following:

- **Airfield:** Runways, taxiways, runway protection zones, approach areas, and land within the building restriction lines.
- **General Aviation Commercial:** Fixed based operator (FBO) facilities involving the sale of general aviation products and services to the general public and limited service commercial facilities, such as avionics sales and repair shops, aircraft paint shops and aircraft maintenance facilities.
- **General Aviation Non-Commercial:** Facilities for the basing and servicing of aircraft owned by individuals or organizations. To be used solely for the benefit of the private aircraft owner.
- **Airport Support:** Facilities that provide airport-related services, such as airport administration, airport maintenance, aviation fuel facilities, pilot lounge and general services facilities, and aircraft rescue and fire-fighting facilities (ARFF).
- **Aviation-Related:** Land which may accommodate aviation-related or aviation-compatible uses such as automobile rental agencies, airport restaurant, motel, or other commercial use to produce revenues for the airport. Such use must be compatible with and not interfere with the existing aviation uses at the airport.
- **Reserved for Future Requirements:** Land that may possibly not be required within the master planning time frame, but should be reserved for potential long-range development of airfield, general aviation, or airport support facilities.
- **Future Acquisition:** Land that should be acquired to protect the ultimate capacity of the airport site, including existing out parcels and large areas for future airport expansion and approach protection.

The land uses depicted on Exhibit 10 are based upon the descriptions as presented above. The designated land uses and their locations are intended to be a broad guideline for future airport development based upon the forecast needs as developed in this Master Plan. Because airport needs can change dramatically over time, this land use plan should be used as a guideline and, if warranted by changes in the aviation demand and character, should be modified to reflect the ongoing needs of the airport.



Off-Airport

The basic responsibility for off-airport land use planning is with the City of Oakdale and the Stanislaus County. The objective of off-airport land use planning is to guide safe, compatible land uses around airports. Aviation-related factors to be considered and evaluated when planning land uses or redeveloping lands adjacent to airports include:

- Aviation noise and its effects on people.
- Safety of persons on the ground.
- Safety of pilots.

Many forms of urban development can cause conflict with aircraft operations. Airspace obstructions such as buildings and transmission lines can significantly decrease airport safety and capacity. Electrical interference can restrict the use of communications and navigation equipment. Offsite lighting can make it difficult for pilots to distinguish between airport lights and others. Developments such as garbage dumps, sewage lagoons, and certain vegetation which attract birds, can create bird-strike hazards. In addition, smoke, odors, and intensive noise each have separate and negative impacts on airport operations. The accumulation of these and other factors can reduce and sometimes eliminate the usefulness of an airport.

Since an airport can attract a variety of land uses, planning for the airport environment attempts to encourage activities best able to take advantage of a location near an airport. This involves two approaches: (1) the prohibition of uses negatively related to the airport, and (2) the encouragement of uses benefited by an airport location. Those uses most attracted to the airport are generally those least bothered by noise and other annoyances. The presence of these attracted uses acts as a buffer to uses which are negatively affected. Compatible land uses near airports typically have one or more of the following characteristics: they are (1) land uses involving few people, such as natural or open areas, (2) uses which are noisy, such as industries, (3) indoor uses, especially commercial and industrial use, which can be protected from noise by sound reduction construction, and (4) airport-related uses.

The area affected by airport operations is normally termed the airport's "environs." Generally, aircraft noise is the principal consideration in determining an airport's area of influence, but other factors such as safety of pilots and persons on the ground, local circulation systems, area development plans, and terrain are often included in the formulation of the influence area. Within the airport environs, planning and zoning authority provide the ability to preserve opportunities for airport development and minimize off-airport land use incompatibility. With a clear policy established regarding land use in proximity to an airport and with the regulatory mechanisms to assure implementation of that policy, off-airport development decisions can be made easily and rapidly. Unfortunately, the importance of this approach is often misunderstood or disregarded.

Key elements of the Oakdale Municipal Airport Master Plan update affecting land use decisions in the airport include:

- Increases in aviation activity.
- The proposed extension of runway 10-28 from 3,020 feet in length to 4,400 feet.
- Modifications to the approach and runway protection zones, FAR Part 77 surfaces, and safety areas as a result of the proposed runway extension.
- Land acquisition for runway approach protection and expansion.

Land Use Control Strategies

Local land use plans, ordinances and policies are the principal means for ensuring land use compatibility in the vicinity of an airport. Various land use control strategies that can be used in the Oakdale Municipal Airport environs are described below.

The City of Oakdale and the Stanislaus County can act to prevent adverse noise and safety conditions from occurring in the airport environs, and to protect the airport from encroachment by incompatible land uses through the adoption of the new Oakdale General Plan and the Stanislaus County General Plan.

In addition to considering potential aircraft noise impacts, the City and County can also adopt specific airport safety, height, and obstruction clearance criteria. These standards are set forth in Federal Aviation Regulations, Part 77 (FAR Part 77). Both the City of Oakdale and Stanislaus County have adopted airport approach zoning ordinances which regulate and restrict the height of structures and objects, and regulate the use of airspace in the vicinity of the airport. Updated ordinances will be needed for the new airport master plan.

Aircraft Noise

A major potential conflict between continued airport use and off-airport development centers on noise impact. The FAA's Integrated Noise Model (INM), Version 4.11 was used to perform calculations and produce contours of equal noise exposure for this study. Noise exposure maps for 1995 operational conditions and 2015 forecast conditions are set forth below. The noise modeling conducted for this study was supported by thorough inventory, use and documentation of all pertinent variables which influence aircraft noise generation.

Key variables in the noise modeling effort included existing and forecast aircraft activity levels, aircraft types, time of day of operations, flight tracks, and flight procedures in use, among others. Data describing these variables was arranged and input to the computer model to produce contours of equal cumulative noise levels expressed in Community Noise Equivalent Level (CNEL) metric. CNEL is the methodology specified in the California Airport Noise Standards. CNEL adds an additional 5dB penalty to events occurring during evening hours, and an additional 10dB penalty during nighttime hours to account for increased annoyance.

Information on current 1995 were estimated, since actual counts do not exist.

Forecast activity levels for the year 2015 were derived from the updated Airport Master Plan. Table 26 sets forth average day aircraft operations by aircraft classes used in noise modeling assumptions for 1995 and 2015. As can be seen from Table 26, average day aircraft operations are forecast to increase by 40 percent between 1995 and 2015. Forecast noise contours for the year 2015 allow for these increased operations as well as for anticipated changes in the aircraft fleet mix using the airport.

Table 26
Average Day Operations By Aircraft Class
Oakdale Municipal Airport

<u>ITINERANT*</u>	<u>1995</u>	<u>2015</u>
Lt. Turbofan (Lear 35)	0	1.2
Lt. Quiet TF (Cessna 500)	0.6	1.7
Turboprop (Kingair)	1.8	4.6
Twin-Eng. Prop (B-58)	1.5	3.1
Single-Eng. Prop. (C-172)	<u>52.0</u>	<u>68.4</u>
Subtotal	56.0	79.0
<u>LOCAL/T&G</u>		
Twin-Eng. Prop.	4	6
Single-Eng. Prop.	<u>40</u>	<u>56</u>
Subtotal	44	62
TOTAL	100	141

* Aircraft types are representative and for informational purposes only.

Table 27 shows general land use designations along with guidelines on compatibility with specific aircraft noise levels. The designations contained in this table do not constitute a determination that any use of land covered by the table is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. Land uses determined to be appropriate by local authorities in response to locally determined needs and values may be inconsistent with the guidelines in this table.

State of California airport noise standards as well as Federal Aviation Regulations (Part 150) establish a CNEL of 65 dBA as the maximum acceptable noise exposure for residential land uses. This criterion is set primarily with regard to air carrier airports in urban locations. For typical general aviation airports and less noisy suburban or rural settings, a 60 CNEL standard can be used.

CNEL noise contours for current conditions (1995) and future conditions (2015) were calculated. Exhibit 11 shows the current 1995 CNEL situation. The future 2015 conditions were analyzed with and without the recommended runway extension. It was found that there was improvement in the CNEL contours with the extension, since the most active runway 28 end will shift east away from developed areas. Exhibit 12 shows the 2015 contours with the runway extension.

Currently there are some residences north of the runway, yet they are clear of the 65 CNEL contour.

Table 27
Land Use Compatibility Guidelines

Land Use	Below CNEL 65	CNEL 65-70	CNEL 70-75	CNEL 75-80	CNEL 80-85	Over CNEL 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail--building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade--general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

CNEL = Community Noise Equivalent Level

Y (Yes) = Land Use and related structures compatible without restrictions

N (No) = Land Use and related structures are not compatible and should be prohibited

NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35 = Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Land Use Compatibility Guidelines Table:

- (1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
- (2) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
- (3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
- (4) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
- (5) Land use compatible provided special sound reinforcement systems are installed.
- (6) Residential buildings require an NLR of 25.
- (7) Residential buildings require an NLR of 30.
- (8) Residential buildings not permitted.

Source: Wadell Engineering Corporation, based on FAA Regulations Part 150, "Airport Noise Compatibility Planning," Revised January 18, 1985.

Safety

In addition to the airport noise as a consideration in planning compatible land uses, it is important to consider safety from two different perspectives: people who may live or work in the area around the airport and pilot/aircraft safety.

The proposed Airport Master Plan sets forth only one major capital development measure that could affect safety and off-airport land use. This is the easterly extension of Runway 10-28 from 3,020 feet to 4,400 feet. The Airport Layout Drawing depicts the proposed runway extension.

The principal effect of the runway extension would be to extend the FAR Part 77 surfaces for Runway 28 by 1,380 feet to the east. The Airport Airspace Drawing sets forth the new approach and runway protection zones which have been modified to accommodate the proposed runway extension by shifting the Runway 28 approach and protection zones, and FAR Part 77 imaginary surfaces to the east. Given that the area over which the Part 77 surfaces have been modified is undeveloped agricultural land, the net effect of the proposed runway extension on air safety, obstruction clearance, and hazards to navigation is positive.

There have been occasional aircraft incidents and accidents at the Oakdale Municipal Airport. In 1994 there were two serious accidents, one involving the crash of a twin engine aircraft on a training flight, and the second the crash of a single engine aircraft also on a training flight. The single engine aircraft came to rest in the Oakdale Irrigation District canal just over 200 feet east of the runway 28 threshold. The runway extension will include covering the canal within the runway safety area, and provide a longer runway for twin engine aircraft. This is a high priority airport safety project.

Land Use and Recommended Changes

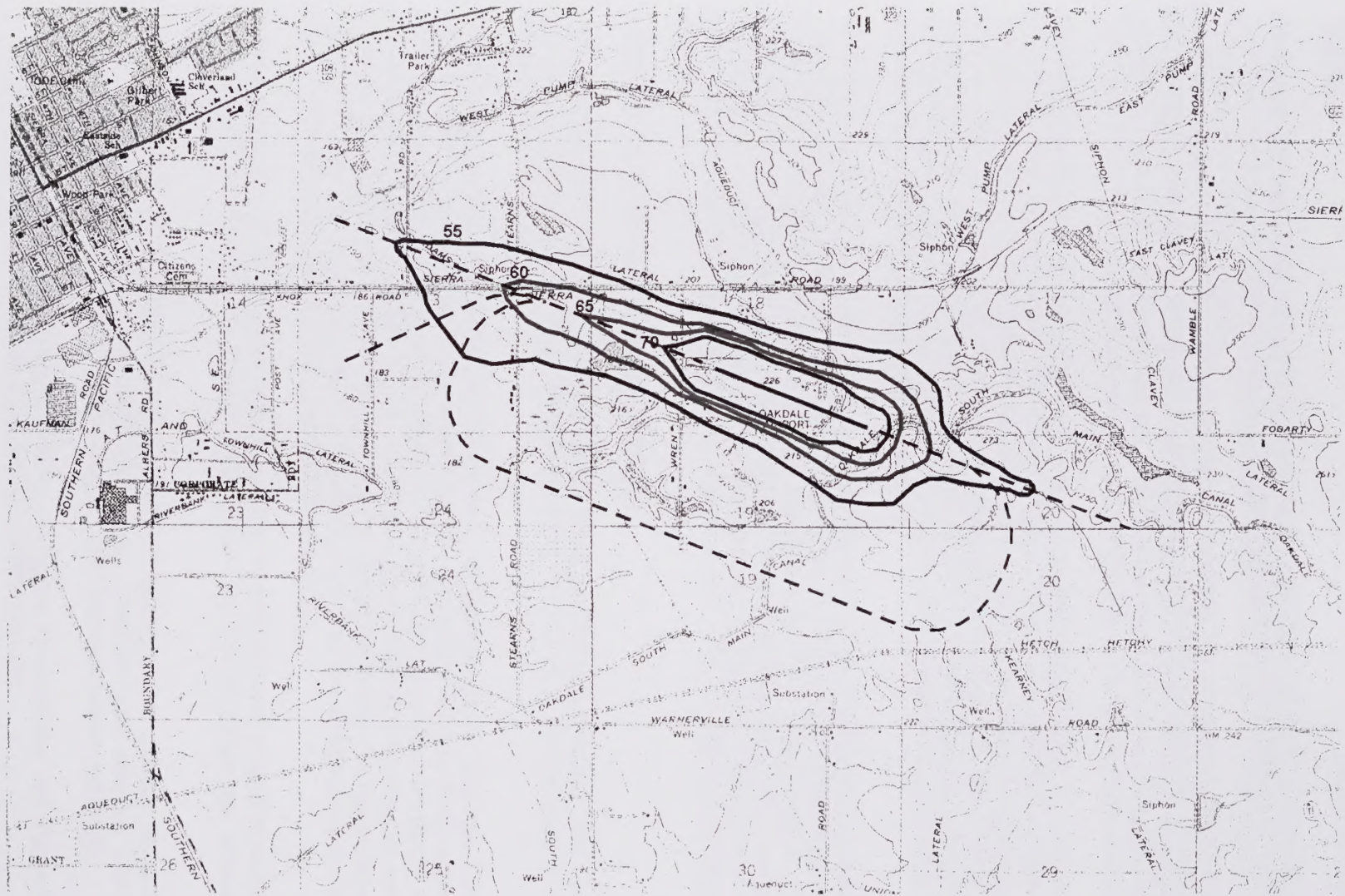
Land in the airport environs is controlled by either the City or Stanislaus County. There are no current or anticipated land use incompatibilities, since the airport is located east of the most developed portions of the City.

It should also be noted that Stanislaus County does not have an Airport Land Use Commission (ALUC), which is the usual vehicle for reconciling the overlapping interests of city agencies and land use designations with those of the county. No formal Airport Land Use Plan (ALUP) has been formulated for Oakdale Municipal Airport. However, it is recommended that the City and County adopt the Draft Airport Approach Zone Regulation that would accomplish the same purpose as an ALUP. The City and County should also coordinate their land use designations for the airport vicinity in the current updates of their respective General Plans.

In the accomplishment of the above, this Master Plan recommends that no land in the immediate airport vicinity be designated or zoned for incompatible uses such as residences, schools, hospitals, and the like.

- Amend Airport Approach Zoning Regulations to accommodate changes to the FAR Part 77 imaginary surfaces, approach and runway protection zone surfaces, and building restriction line as a result of implementation of the proposed runway extension.
- Use the 2015 Noise Exposure Map as the basis for assessing the compatibility of proposed noise sensitive development in the airport environs.

- Make a consistency determination on the Oakdale 2005 General Plan Update by the Oakdale City Planning Commission.
- Update the existing ALUP for Oakdale Municipal Airport to reflect the 1990 noise exposure levels, the Master Plan update, and recent modifications to the ALUC requirements.
- No other policy elements of the City General Plan need be modified at this time. It is recommended that the existing "airport environs" definition be retained, as well as the Airport Area of Influence and Referral Area.



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WADELL ENGINEERING CORPORATION

Exhibit 11
Current CNEL Contours
Oakdale Municipal Airport Master Plan

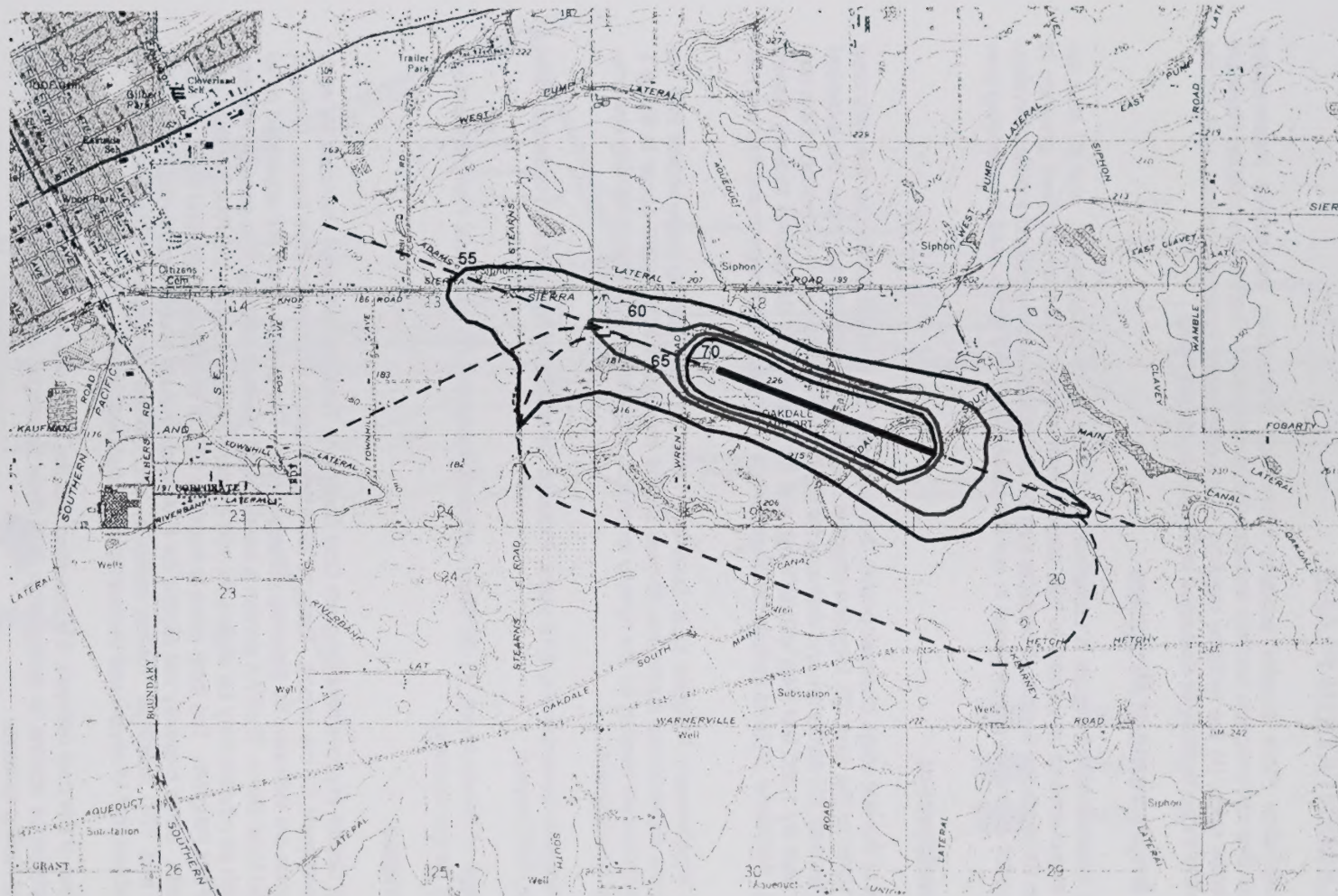


Exhibit 12
Future CNEL Contours
Oakdale Municipal Airport Master Plan



6. IMPLEMENTATION PLANS

The Implementation Plans chapter contains information concerning the capital improvement program, the financial program, and the implementation schedule. The Implementation Plans are prepared based upon (1) the facilities required to accommodate forecast demand, and (2) the development of those facilities as discussed in Chapter 5, Airport Plans.

Capital Improvement Program

The Capital Improvement Program is comprised of (1) stages of development, and (2) cost estimates of improvements proposed in this Master Plan study. The development program is presented in three stages so that all projects can be undertaken when demand justifies development. The cost estimates are prepared in current dollars, and are to be used for planning purposes only.

Stage Development

The projects of the first stage of development, 0-5 years, are (1) land acquisition for the extension of Runway 10-28 to the east, (2) irrigation channel relocation and structures under the extended runway and taxiway, (3) earthwork and drainage for the runway extension, (4) extension of the runway 75 feet wide by 1,380 feet long with lighting, and (5) extension of the parallel taxiway system with lighting. Additional projects include development of T-hangars with taxiways and fuel farm replacement.

The Capital Improvement Program Cost Summary Table on the following page shows that the most significant expenditures during the 20-year capital improvement program occur in Stage I. These expenditures are needed for the runway extension, associated taxiway and lighting systems, and T-hangar development.

The second stage of development, 6-10 years, includes (1) additional hangars with taxiways, and (2) a localizer/DME navaid.

The third stage of development, 11-20 years, primarily concerns (1) additional hangar development, and (2) hangar taxiways.

Cost Estimates

The following Capital Improvement Program Cost Summary, Table 28, indicates the costs for each stage of development for the airport. Table 29 identifies projects within each time frame. Order of magnitude costs are indicated for planning purposes only. The project costs are separated as to FAA share and local share. The FAA portion is based on 90 percent funding. It is possible that certain items such as navaids may be eligible for 100 percent funding through the FAA Facilities and Equipment (F&E) Program. The local share is normally 10% of eligible projects, and 100% of non-eligible projects. Items presently not eligible for FAA funds include revenue producing auto parking, hangar and FBO buildings, fueling systems, and utilities serving ineligible facilities. All eligibility is subject to FAA review and the outcome of future legislation.

For the purpose of this cost estimate, it is assumed that the FBO's will maintain their own auto parking and maintenance aprons in conjunction with their buildings, and the City will develop all T-hangars and fueling systems.

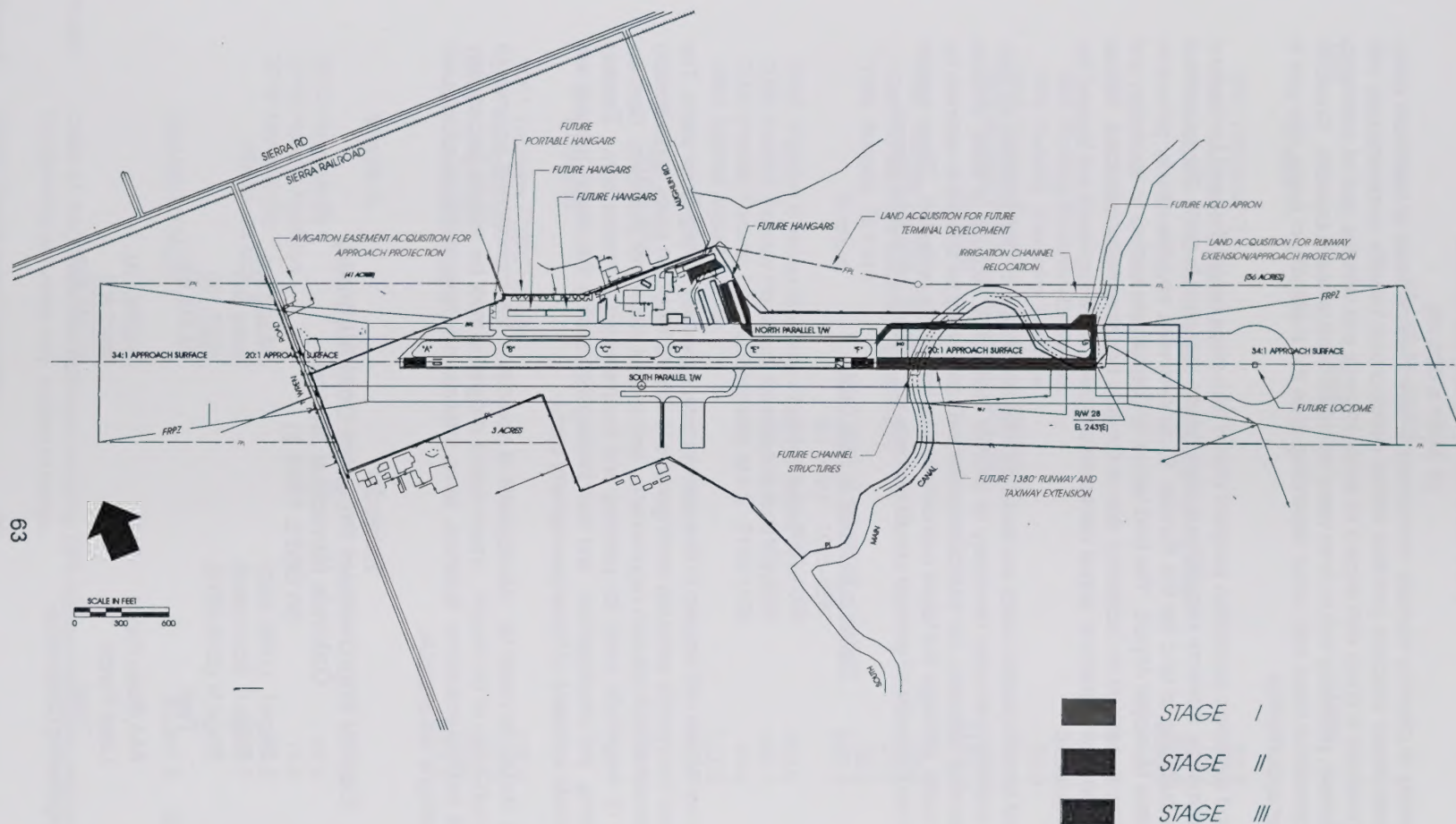


Exhibit 13
Stage Development Plan
Oakdale Municipal Airport Master Plan

Definitions of capacity in planning manuals incorporate a reasonable amount of maximum delay. The timing of development indicated provides airfield development benefits commensurate with costs. Each improvement is timed with respect to safety to users and with the goal of commencing facility development, preferably two to three years before demand exceeds capacity. Construction prior to the operational dates may occur depending upon the availability of funds, changes in demand, and other opportunities.

The airport land and easement acquisition program should take place before the need for the land is needed for construction, therefore acquisition is identified as occurring in 1997. The acquisition program includes purchase of land for the Runway 10-28 extension and the runway protection zones at the Oakdale Municipal Airport. The land values in Oakdale are subject to escalation and change. Values may escalate at an increasing rate as the area becomes more urbanized. Values per acre were used as approximations; actual values are unknown since appraisals are beyond the scope of work of this study.

All construction and land acquisition costs are based on 1995 dollar values. Quantities are for minimum acquisition and improvements necessary to provide acceptable facilities to meet forecast demands. For planning purposes, the multipliers presented below may be applied to estimate future construction costs, although the future economy cannot be exactly projected. These escalations are based on an extrapolated average annual increase at 5 percent compound interest.

Range in Multiplier of 1995 Costs

1995-2001	1.0 to 1.3
2001-2005	1.4 to 1.8
2006-2010	1.9 to 2.3
2011-2015	2.4 to 2.9

There are many uncertainties with respect to forecasting costs, especially in long-range plans. The airport owner should incorporate adequate contingencies to cover changes in costs, sophistication of equipment, environmental protection requirements, and special studies or programs. Cost estimates are order of magnitude costs for planning and programming purposes only. Detailed topographic mapping, soil investigations, and field investigation during the design process will result in more accurate estimates of future development costs.

Grant applications should be made for development of portions of the improvement program to complete specific sub-areas of the airport. Improvement programs must be realistic and comply with FAA and local funding limitations; therefore, some projects may have to shift to subsequent time periods, if funding is not available.

Table 28
Capital Improvement Program Cost Summary
Oakdale Municipal Airport
(In 000's 1995 \$)

Stage I (1995-2000)	\$2,522,300
Stage II (2001-2005)	\$512,500
Stage III (2006-2015)	<u>\$207,100</u>
Total	\$3,241,900
FAA/State Funds	\$2,548,100
Local Funds	<u>\$693,800</u>
Total	\$3,241,900

Source: Wadell Engineering Corporation

TABLE 29
CAPITAL IMPROVEMENT PROGRAM COST ESTIMATES
OAKDALE MUNICIPAL AIRPORT
(in 000's 1995 \$)
(As of 10-20-95)

<u>Year</u>	<u>Stage</u>	<u>Total</u>	<u>FAA Share</u>	<u>Local Share</u>
STAGE 1:				
1995	Hangars (7)	52.5	0.0	52.5
1996	Fuel Farm Replacement	75.0	0.0	75.0
1996	Irrigation Channel Structure - Runway Safety Area	<u>562.5</u>	<u>506.3</u>	<u>56.2</u>
	Subtotal	\$690.0	\$506.3	\$183.7
1997	Land Acquisition	\$300.0	\$270.0	\$30.0
1998	Runway Extension Earthwork	343.8	309.4	34.4
1998	Runway Extension Drainage	50.0	45.0	5.0
1999	Runway Pavement Extension (75'X1380')	323.4	291.1	32.3
1999	Runway Pavement Widening (9'x3,020')	<u>84.9</u>	<u>76.4</u>	<u>8.5</u>
	Subtotal	\$802.1	\$721.9	\$80.2
1999	Runway Lighting Extension	25.0	22.5	2.5
1999	Runway End Identifier Lights (REIL)	37.5	33.8	3.7
1999	Runway 28 PAPI	<u>25.0</u>	<u>22.5</u>	<u>2.5</u>
	Subtotal	\$87.5	\$78.8	\$8.7
2000	Irrigation Channel Structure - Taxiway Safety Area	300.0	270.0	30.0
2000	Parallel Taxiway Pavement Extension & Hold Apron	189.7	170.7	19.0
2000	Parallel Taxiway Lighting Extension	40.5	36.5	4.0
2000	Lighted Airport Signing	<u>112.5</u>	<u>101.3</u>	<u>11.2</u>
	Subtotal	\$642.7	\$578.5	\$64.2
TOTAL STAGE 1		\$2,522.3	\$2,155.5	\$366.8
STAGE 2:				
2001	Localizer / DME Navaid	375.0	375.0	0.0
2001	Hangars (5)	37.5	0.0	37.5
2005	Hangars (5)	<u>100.0</u>	<u>0.0</u>	<u>100.0</u>
TOTAL STAGE 2		\$512.5	\$375.0	\$137.5
STAGE 3:				
2010	Hangars (5)	93.8	0.0	93.8
2010	Hangar Taxiways	19.5	17.6	1.9
2015	Hangars (5)	<u>93.8</u>	<u>0.0</u>	<u>93.8</u>
TOTAL STAGE 3		\$207.1	\$17.6	\$189.5
GRAND TOTALS:		\$3,241.9	\$2,548.1	\$693.8

Notes: Order of magnitude cost estimates including 25% administration and engineering.
For planning purposes only, subject to design.

Source: Wadell Engineering Corporation

APPENDIX A: GLOSSARY

APPENDIX A GLOSSARY

Aircraft Approach Category. A grouping of aircraft based on 1.3 times stall speed in a landing configuration at maximum certificated landing weight. The categories are A, B, C, D, and E.

Airplane Design Group (ADG). A grouping of airplanes based on wingspan. The groups are I, II, III, IV, V, and VI.

Airport Elevation. The highest point on an airport's usable runway expressed in feet above mean sea level (MSL).

Airport Layout Plan (ALP). The plan of an airport showing the layout of existing and proposed airport facilities.

Airport Reference Code (ARC). A coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. The code has two components relating to the airport design aircraft. The first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed. The second component, depicted by a Roman numeral, is the airplane design group and relates to airplane wingspan.

Airport Reference Point (ARP). The latitude and longitude of the approximate center of the airport.

Blast Fence. A barrier used to divert or dissipate jet blast or propeller wash.

Building Restriction Line (BRL). A line which identifies suitable building area locations on airports.

Clearway (CWY). A defined rectangular area beyond the end of a runway cleared or suitable for use in lieu of runway to satisfy takeoff distance requirements.

Compass Calibration Pad. An airport facility used for calibrating an aircraft compass.

Declared Distances. The distances are:

Takeoff run available (TORA) - the runway length available for takeoff.

Takeoff distance available (TODA) - the runway length available for takeoff plus the length of available clearway (CWY).

Accelerate-stop distance available (ASDA) - the runway length available for takeoff plus the length of available stopway (SWY).

Landing distance available (LDA) - the runway length available for landing.

Hazard to Air Navigation. An object that the FAA determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential airport capacity.

Heavy Airplane. An airplane weighing more than 255,000 pounds maximum certificated takeoff weight.

Large Airplane. An airplane weighing more than 41,000 pounds maximum certificated takeoff weight, but less than 255, 000 pounds.

Object. Includes, but is not limited to above ground structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain, and parked aircraft.

Object Free Area (OFA). A two dimensional ground area surrounding runways, taxiways, and taxilanes which is clear of objects except for objects whose location is fixed by function.

Obstacle Free Zone (OFZ). The airspace defined by the runway OFZ and, as appropriate, the inner-approach OFZ and the inner-transitional OFZ, which is clear of object penetrations other than frangible NAVAIDs.

Runway OFZ - the airspace above a surface centered on the runway centerline.

Inner-approach OFZ - the airspace above a surface centered on the extended runway centerline. It applies to runways with an approach lighting system.

Inner-transitional OFZ - the airspace above the surfaces located on the outer edges of the runway OFZ and the inner-approach OFZ. It applies to precision instrument runways.

Obstruction to Air Navigation. An object of greater height than any of the heights or surfaces presented in Subpart C of FAR Part 77. Obstructions to air navigation are presumed to be hazards to air navigation until an FAA study has determined otherwise.

Runway (RW). A defined rectangular surface on an airport prepared or suitable for the landing or takeoff of airplanes.

Runway Blast Pad. A surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

Runway Protection Zone (RPZ). An area, formerly the clear zone, used to enhance the safety of aircraft operations. It is at ground level beyond the runway end.

Runway Safety Area (RSA). A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Runway Type. A runway use classification related to its associated aircraft approach procedure. The runway types are:

Visual runway - a runway without an existing or planned straight-in instrument approach procedure.

Nonprecision instrument runway - a runway with an approved or planned straight-in instrument approach procedure which has no existing or planned precision instrument approach procedure.

Precision instrument runway - a runway with an existing or planned precision instrument approach procedure.

Shoulder. An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface, support for aircraft running off the pavement, enhanced drainage, and blast protection.

Small Airplane. An airplane weighing 41,000 pounds or less maximum certificated takeoff weight.

Stopway (SWY). A defined rectangular surface beyond the end of a runway prepared or suitable for use in lieu of runway to support an airplane, without causing structural damage to the airplane, during an aborted takeoff.

Taxilane (TL). The portion of the aircraft parking area used to access taxiways and aircraft parking positions.

Taxiway (TW). A defined path established for the taxiing of aircraft from one part of an airport to another.

Taxiway Safety Area (TSA). A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

Threshold (TH). The beginning of that portion of the runway available for landing. When the threshold is located at a point other than at the beginning of the pavement, it is referred to as either a displaced or a relocated threshold depending on how the pavement behind the threshold is used.

Displaced threshold - the portion of pavement behind a displaced threshold is available for takeoffs in either direction and landings from the opposite direction.

Relocated threshold - the portion of pavement behind a relocated threshold is not available for takeoff or landing. It may be available for taxiing of aircraft.

Transport Airport. An airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Category C and D.

Utility Airport. An airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Category A and B.

APPENDIX B: AIRPORT DRAWINGS

1. The first step in the process of identifying a problem is to define the problem clearly and concisely.

2. The second step is to gather information about the problem and its causes.

3. The third step is to analyze the information and identify the root cause of the problem.

4. The fourth step is to develop a plan of action to address the problem.

5. The fifth step is to implement the plan and monitor the results.

6. The sixth step is to evaluate the results and make adjustments as needed.

7. The seventh step is to document the process and results for future reference.

8. The eighth step is to communicate the results to the relevant stakeholders.

9. The ninth step is to review the process and make improvements as needed.

10. The tenth step is to ensure that the problem is resolved and the system is functioning properly.

11. The eleventh step is to provide training and support to the users of the system.

12. The twelfth step is to conduct regular maintenance and updates to the system.

13. The thirteenth step is to ensure that the system is secure and protected from unauthorized access.

14. The fourteenth step is to ensure that the system is compliant with relevant regulations and standards.

15. The fifteenth step is to ensure that the system is scalable and can handle future growth.

16. The sixteenth step is to ensure that the system is user-friendly and easy to use.

17. The seventeenth step is to ensure that the system is reliable and available when needed.

18. The eighteenth step is to ensure that the system is cost-effective and provides good value for money.

LOCATION & VICINITY MAP



APPENDIX B: AIRPORT DRAWINGS

ENGINEERING OFFICE

APPENDIX B: AIRPORT DRAWINGS

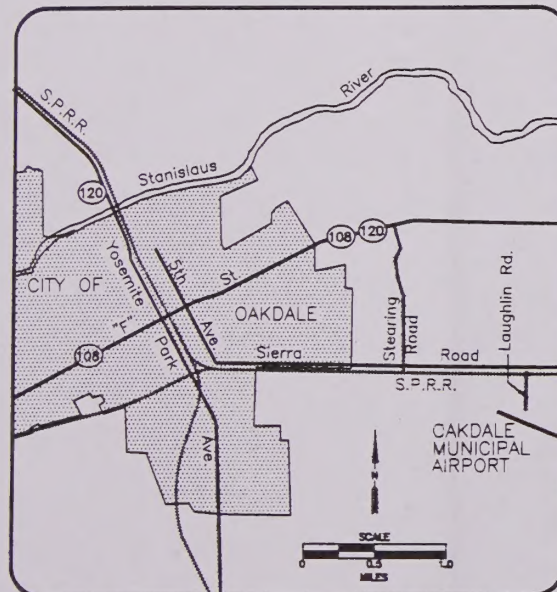
OAKDALE MUNICIPAL AIRPORT

AIRPORT LAYOUT PLAN DRAWINGS

A CITY OF OAKDALE AVIATION FACILITY
OAKDALE, CALIFORNIA

AIRPORT IMPROVEMENT PROGRAM
PROJECT NO. 3-06-0168-02

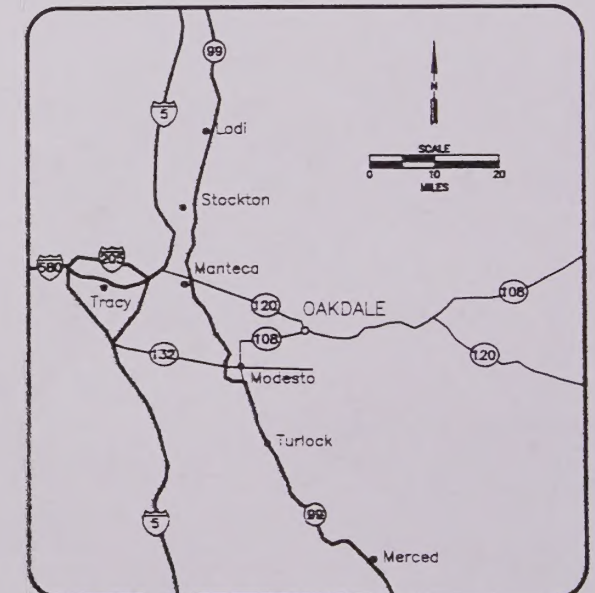
LOCATION MAP



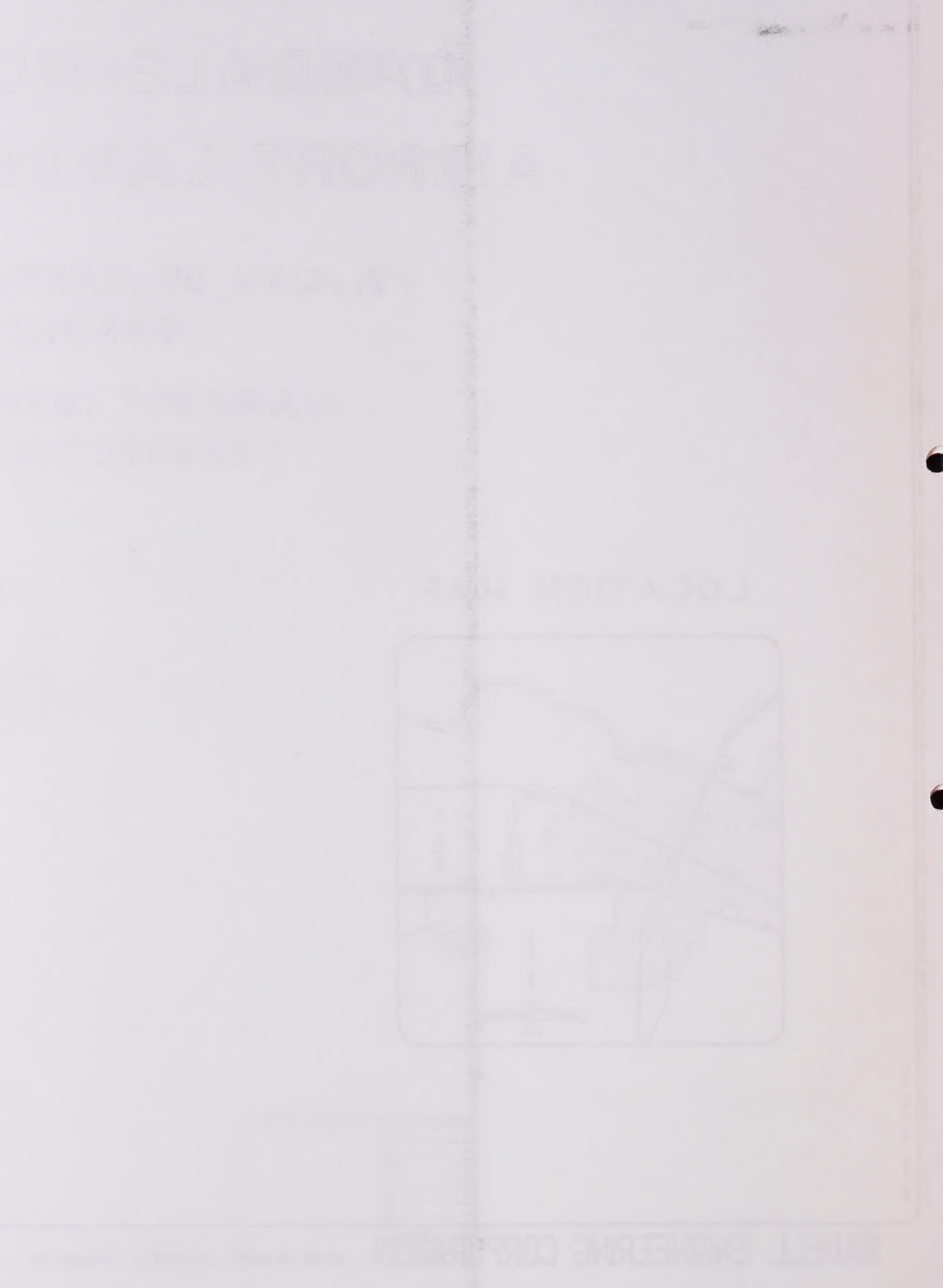
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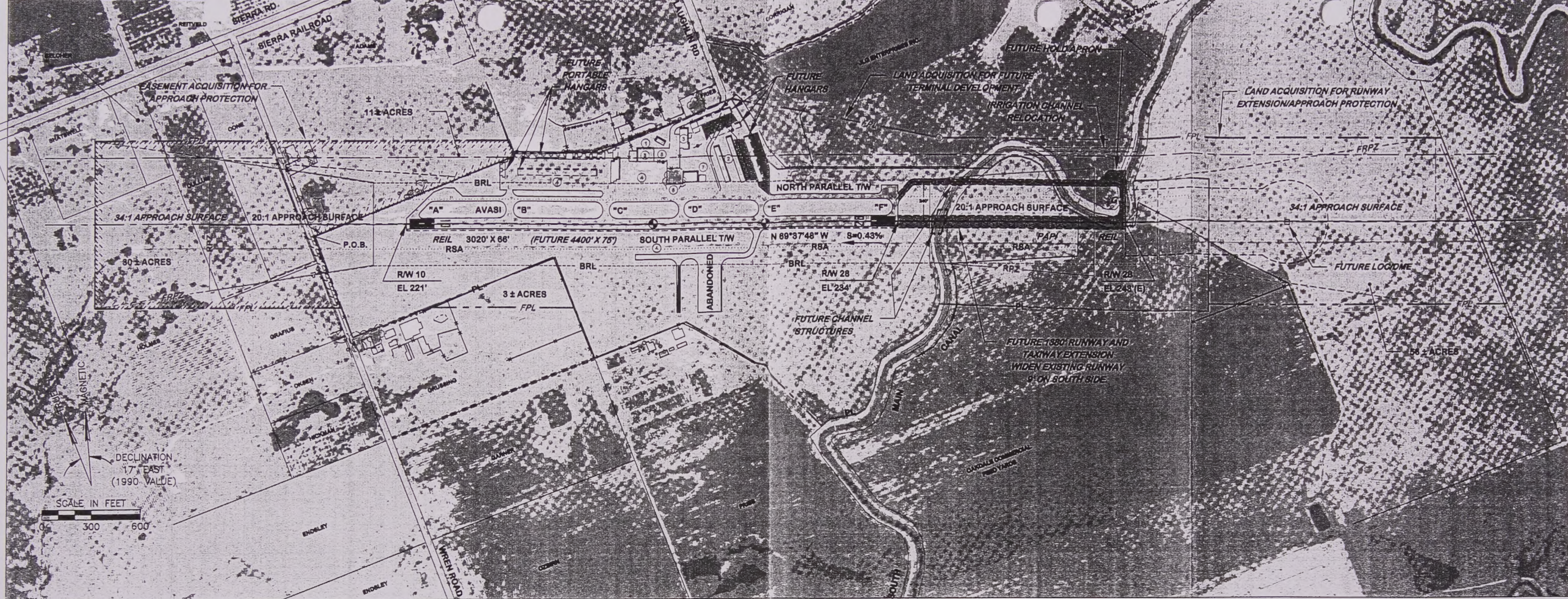
SHEET	
1	AIRPORT LAYOUT DRAWING
2	TERMINAL AREA DRAWING
3	APPROACH & RUNWAY PROTECTION ZONE DRAWING
4	STAGE DEVELOPMENT DRAWING
5	AIRPORT PROPERTY MAP

VICINITY MAP



OAKDALE MUNICIPAL AIRPORT A CITY OF OAKDALE AVIATION FACILITY OAKDALE CALIFORNIA		SHEET - - - SHEETS
TITLE SHEET		SCALE AS SHOWN
NO. DATE BY DESIGNED DLH CHECKED REVIEWED REPW	JOB NUMBER 1195 DRAWING NUMBER 195-UTSD	DATE OCT 1995





LEGEND		
	EXISTING	FUTURE
AIRPORT REFERENCE POINT		
AIRPORT PROPERTY LINE		
AVIATION EASEMENT		
BUILDING RESTRICTION LINE		
RUNWAY SAFETY AREA		
RUNWAY PROTECTION ZONES		
BUILDINGS		
DRAINAGE		
FACILITIES		
FACILITY TO BE REMOVED	N/A	X
FENCE		
LIGHTING		
WIND CONE		

FACILITY DATA	
1	AIRPORT BEACON/NAUT
2	HANGARS
3	FBO
4	APRON
5	AUTO PARKING
6	FUEL FARM
7	WASH RACK
8	
9	
10	
11	
12	

AIRPORT DATA			
	EXISTING	FUTURE	
AIRPORT REFERENCE CODE	A-1	B-II	
ELEVATION (MSL)	234'	243'	
TEMPERATURE (MEAN MAX. OF HOTTEST MONTH)	97°F	SAME	
REFERENCE POINT COORDINATES	LATITUDE	N 37°45'23"	N 37°45'20"
	LONGITUDE	W 120°48'01"	W 120°47'49"
NAVIGATIONAL AIDS	VOR/DME	LOCALIZER/DME	
	FEE TITLE	116.6	166
ACREAGE	AVIATION EASEMENT	21.2	41
	TIEDOWNS	20	76
BASED AIRCRAFT PARKING DEMAND	HANGARS/SHELTERS	38	64
	TOTAL	58	80
TRANSIENT AIRCRAFT TIEDOWN DEMAND	7	10	
AIRPORT RESCUE & FIRE FIGHTING INDEX (ARFF)	N/A	N/A	

TAXIWAY DATA							
T/W	TYPE	PAVEMENT SURFACE	PAVEMENT WIDTH		STRENGTH (1000#) SINGLE GEAR		SIGNING/LIGHTING
			EXISTING	FUTURE	EXISTING	FUTURE	
A	PARALLEL	A.C.	30'	35'	20	30	MTL SAME
B	EXIT	A.C.	40'	SAME	20	30	MTL SAME
C	EXIT	A.C.	45'	SAME	20	30	MTL SAME
D	EXIT	A.C.	30'	35'	20	30	MTL SAME
E	EXIT	A.C.	30'	35'	20	30	MTL SAME
F	EXIT	A.C.	30'	35'	20	30	MTL SAME
G	EXIT	A.C.	-	35'	-	30	MTL

RUNWAY DATA			
	RUNWAY 10-28		
	EXISTING	FUTURE	
AIRPORT REFERENCE CODE	A-1	B-II	
RUNWAY CLASSIFICATION	B.L. - I	GENERAL UTILITY II	
PHYSICAL LENGTH AND WIDTH	3020' x 205'	4400' x 75'	
THRESHOLD DISPLACEMENT (D) OR RELOCATION (R)	NONE	NONE	
EFFECTIVE GRADIENT (%)	0.43	0.50	
PAVEMENT STRENGTH (1000#) SINGLE GEAR	20	30	
LIGHTING	MBL/MRSL	H-REIL/PAPI	
MARKING	NON-PRECISION	SAME	
CRITICAL AIRCRAFT	RUNWAY LENGTH	855	K-300
	PAVEMENT STRENGTH	LEAR	SAME
APPROACH TYPE	WINGSPIRAN	855	K-300
	10	NON-PRECISION	NON-PRECISION
APPROACH SLOPE REQUIRED/CLEAR	28	VEHUAL	NON-PRECISION
	10	20:1/30:1	34:1/30:1
APPROACH & LANDING AIDS	28	20:1/30:1	34:1/30:1
	10	VOR/DME	LOC/DME
RUNWAY END COORDINATES	28	NONE	VOR/DME
	10	LAT. N 37°45'28"	SAME
		LONG. W 120°48'14"	SAME
	28	LAT. N 37°45'18"	N 37°45'13"
		LONG. W 120°47'38"	W 120°47'23"
RUNWAY SAFETY AREA DIMENSIONS:	WIDTH	120'	300'
	LENGTH (BEYOND END)	240'	800'
RUNWAY PROTECTION ZONE DIMENSIONS:	10	500/800/1000	500/1070/1700
	28	500/850/1000	500/1070/1700
WIND COVERAGE (%)	12 MPH ALL WEATHER	97.5	SAME
	15 MPH ALL WEATHER	98.0	SAME

FAA APPROVAL

By: _____ Date: _____

786: _____

CITY OF OAKDALE

By: _____ Date: _____

786: _____

NOTES

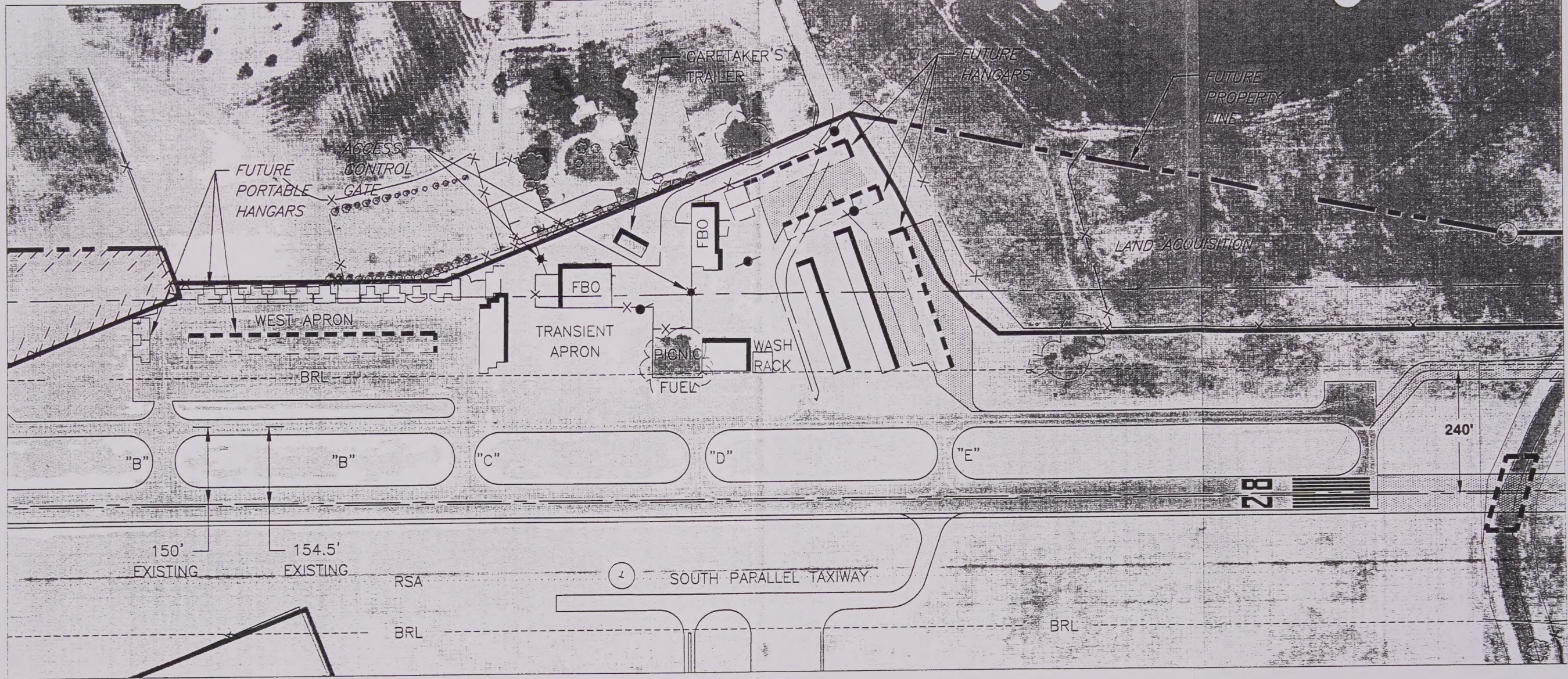
1. ALL AIRFIELD PAVEMENTS ARE ASPHALTIC CONCRETE.
2. SITING OF NAVAIDS AND LIGHTING AIDS SUBJECT TO FAA REVIEW AND DESIGN.
3. TOPOGRAPHY SOURCE MAY 1994 MAPPING.
4. THE AIRPORT IS NOT SUBJECT TO FLOODING.
5. NO AIRPORT HEIGHT ZONING ORDINANCE IS IN EFFECT.
6. CLEAR SLOPES ARE BASED ON ANALYSIS OF MAY 1994 MAPPING TOPOGRAPHY.
7. THE 300' RSA PRESERVES FOR ULTIMATE ILS. FUTURE RSA IS 150' WIDE.
8. WIDEN RUNWAY ON SOUTH SIDE TO INCREASE TAXIWAY SEPARATION.

THE PREPARATION OF THIS DOCUMENT WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS REPORT BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

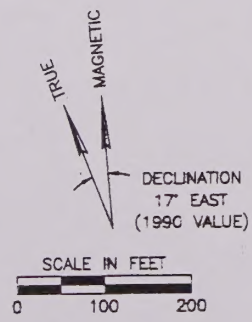


OAKDALE MUNICIPAL AIRPORT A CITY OF OAKDALE AVIATION FACILITY				SHEET 1 5 SHEETS
AIRPORT LAYOUT DRAWING				SCALE AS SHOWN
NO. DATE BY	REVISIONS	JOB NUMBER	1195	DRAWING NUMBER
DRWEN DLH	CHECKED	DESIGNED	QJW	195-1ALD
				DATE OCT 1995

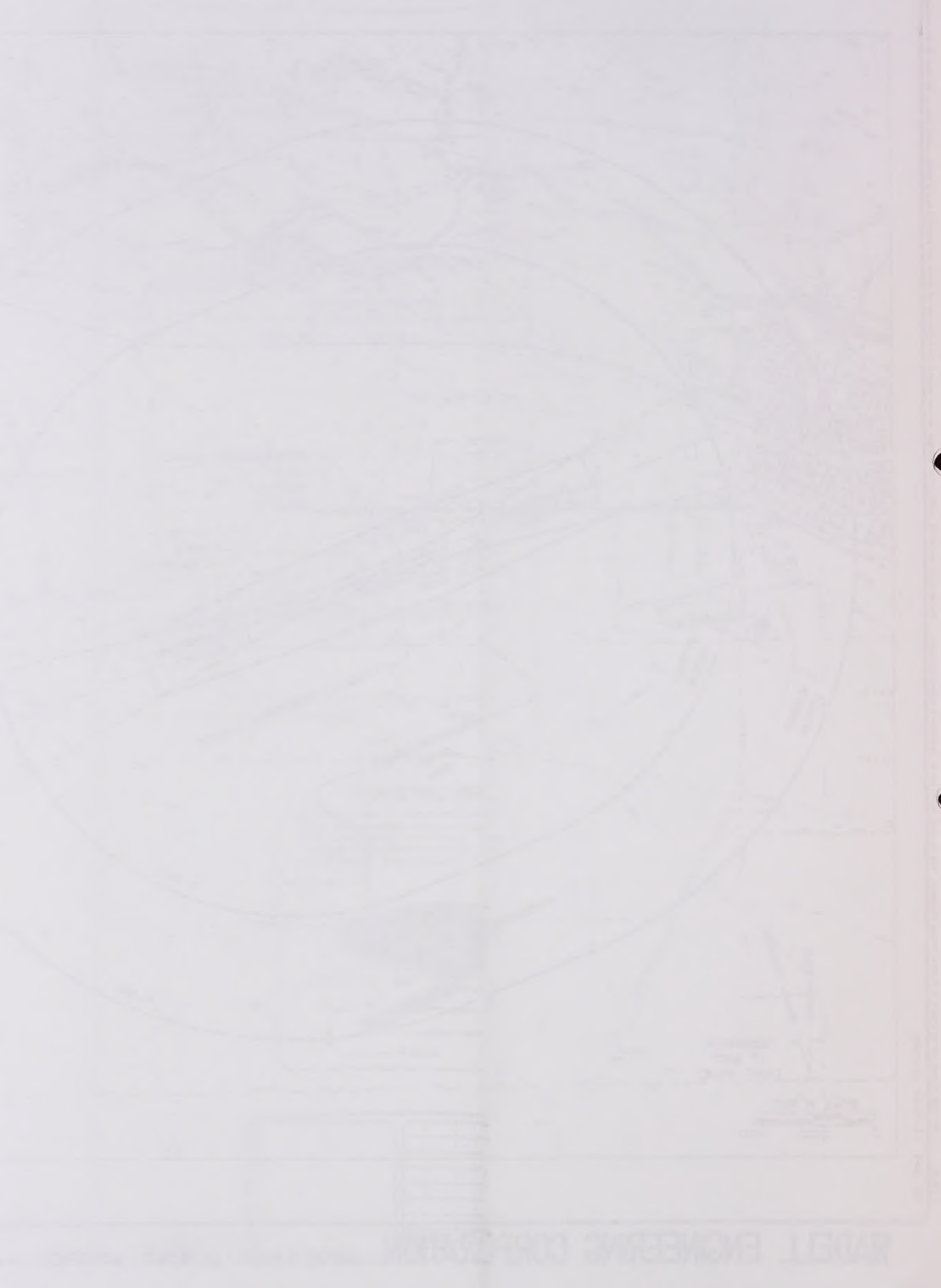
105-37AD 12-10-97 (1-1) XREF:105-1AD



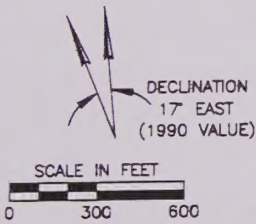
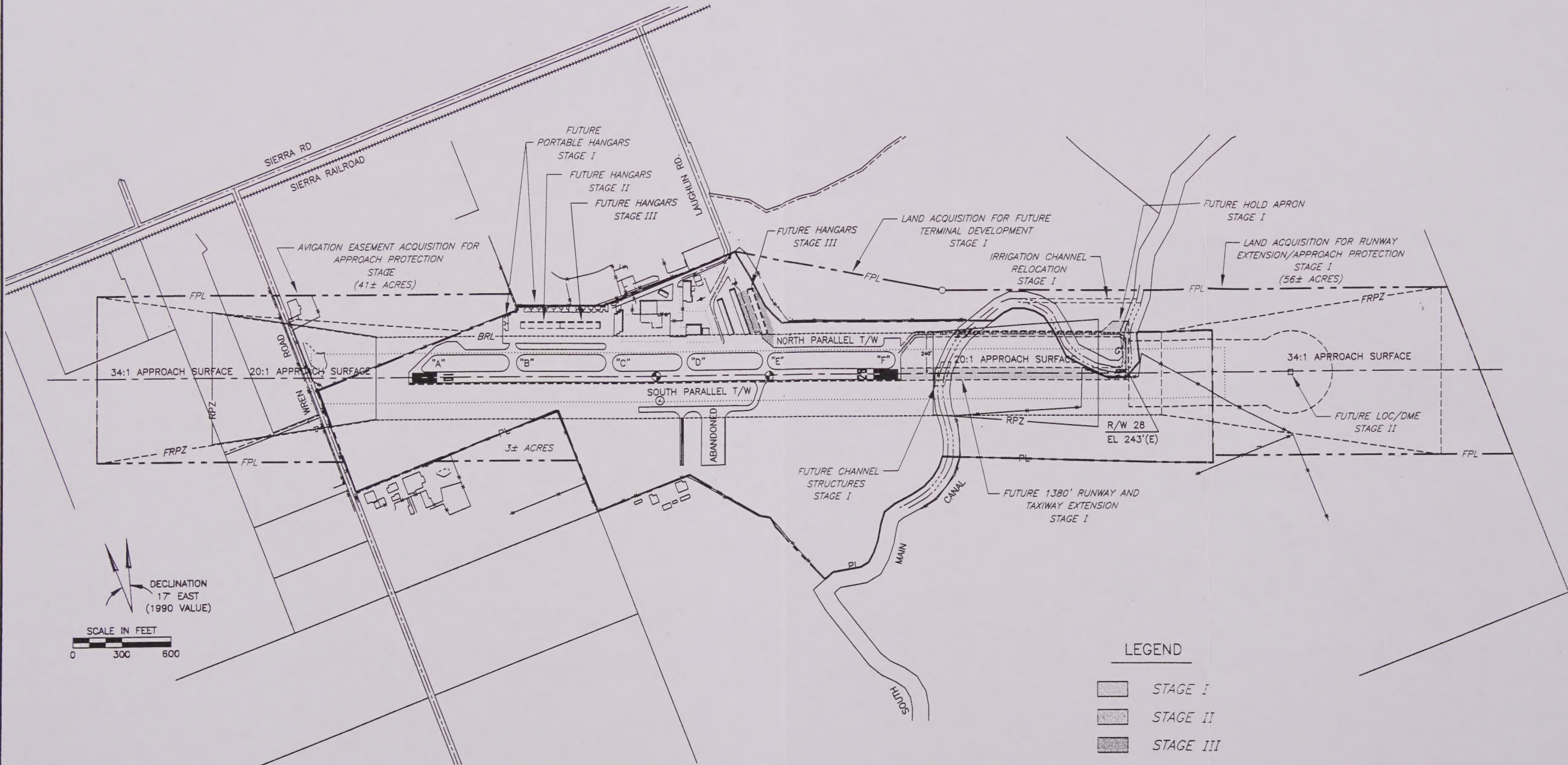
LEGEND		
	EXISTING	FUTURE
AIRPORT REFERENCE POINT		
AIRPORT PROPERTY LINE		
AVIGATION EASEMENT		
BUILDING RESTRICTION LINE		
RUNWAY SAFETY AREA		
RUNWAY PROTECTION ZONES		
BUILDINGS		
DRAINAGE		
FACILITIES		
FACILITY TO BE REMOVED	N/A	
FENCE		
LIGHTING		
WIND CONE		



				OAKDALE MUNICIPAL AIRPORT A CITY OF OAKDALE AVIATION FACILITY OAKDALE CALIFORNIA		SHEET 2 5 SHEETS
				TERMINAL AREA DRAWING		DATE: OCT 1995
NO.	DATE	BY	REVISION	DATE	BY	REVISION
1	12-10-97	DLH	ORIGINAL	12-10-97	DLH	195-27AD



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195-4800 12-11-97 (1-300)



LEGEND

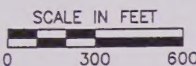
-  STAGE I
-  STAGE II
-  STAGE III

WADDELL ENGINEERING CORPORATION

AIRPORT PLANNING • ENGINEERING • MANAGEMENT san francisco bay area



				OAKDALE MUNICIPAL AIRPORT A CITY OF OAKDALE AVIATION FACILITY OAKDALE CALIFORNIA		SHEET 4 5 SHEETS
				STAGE DEVELOPMENT DRAWING		SCALE AS SHOWN
NO.	DATE	BY	REVISIONS	JOB NUMBER	DRAWING NUMBER	DATE
DRAWN	DLH	CHECKED	DESIGNED	1195	195-4800	OCT 1995



DECLINATION
17° EAST
(1990 VALUE)

SCALE IN FEET

300 600



EXISTING PROPERTY OWNERS

PARCEL NO.	A.P.N. NUMBER	OWNER ADDRESS	PARCEL NO.	A.P.N. NUMBER	OWNER ADDRESS
1.	10-29-05	NORMAN HOLMES 10010 SIERRA ROAD OAKDALE, CA. 95381	15.	10-38-04	NORMAN GRUSING 8100 WREN ROAD OAKDALE, CA. 95381
2.	10-29-15	FARWELL SHATSWELL 10112 SIERRA ROAD OAKDALE, CA. 95381	16.	10-38-03	RICHARD BARNER P.O. BOX 1553 OAKDALE, CA. 95381
3.	10-29-13	LARRY BELCHER 10148 SIERRA ROAD OAKDALE, CA. 95381	17.	10-38-02	AGNES CARRIN 7508 WREN ROAD OAKDALE, CA. 95381
4.	10-29-10	EDWARD CULLUM 10200 SIERRA ROAD OAKDALE, CA. 95381	18.	10-38-28	JOLINE CIEL P.O. BOX 750 OAKDALE, CA. 95381
5.	10-29-08	LEONARD RETVELD 8420 WREN ROAD OAKDALE, CA. 95381	19.	10-38-06	DONALD MC LAREN 8401 LAUREL RD OAKDALE, CA. 95381
6.	10-29-06	CHARLES CONE 8425 WREN ROAD OAKDALE, CA. 95381	20.	10-38-10	WAROLD FRIES 8000 WREN ROAD OAKDALE, CA. 95381
7.	10-29-02	DOUGLAS GRAPUS 8131 WREN ROAD OAKDALE, CA. 95381	21.	10-38-15	ANDREW MESS 10630 SIERRA ROAD OAKDALE, CA. 95381
8.	10-29-03	ALAN OCKEN 8085 WREN ROAD OAKDALE, CA. 95381	22.	10-38-14	RUTH HENY 1004 LAUREL RD OAKDALE, CA. 95381
9.	10-29-04	IRWIN HICOMAN 8001 WREN ROAD OAKDALE, CA. 95381	23.	10-38-13	ALBERT CORROHAN P.O. BOX 87 OAKDALE, CA. 95381
10.	10-38-25	RICHARD DIXSLY 7831 WREN ROAD OAKDALE, CA. 95381	24.	10-38-21	JERRY ECHORD 11048 SIERRA RD OAKDALE, CA. 95381
11.	10-38-28	RICHARD DIXSLY 7831 WREN ROAD OAKDALE, CA. 95381	25.	10-38-19	JLS ENTERPRISES INC P.O. BOX 1378 OAKDALE, CA. 95381
12.	10-38-33	NOT LISTED	26.	10-38-50	JLS ENTERPRISES INC P.O. BOX 1378 OAKDALE, CA. 95381
13.	10-38-31	NOT LISTED	27.	10-38-22	JLS ENTERPRISES INC P.O. BOX 1378 OAKDALE, CA. 95381
14.	10-38-05	MURRELL OMHOON 8442 WREN ROAD OAKDALE, CA. 95381	28.	10-38-30	OAKDALE COMMERCIAL FEED YARDS P.O. BOX 508 OAKDALE, CA. 95381
			29.	10-38-08	KEITH HEE 8001 LAUREL RD OAKDALE, CA. 95381

AIRPORT BOUNDARY

COURSE NO.	BEARING	DISTANCE
1.	N.86° 00'54"E	1,322.28'
2.	N.01° 20'44"W	27.85'
3.	S.88° 17'58"E	5,311.18'
4.	N.02° 04'45"E	98.27'
5.	S.10° 55'41"E	177.38'
6.	S.07° 09'51"E	183.75'
7.	S.22° 10'31"E	71.29'
8.	S.28° 16'19"E	76.83'
9.	S.17° 44'51"E	79.11'
10.	S.88° 37'44"E	10,055.54'
11.	S.89° 37'45"E	1,600.98'
12.	N.71° 58'00"E	72.19'
13.	N.84° 11'00"E	55.88'
14.	S.88° 42'00"E	55.97'
15.	S.17° 42'00"E	98.27'
16.	S.40° 11'00"E	50.04'
17.	S.12° 15'54"E	104.50'
18.	S.06° 38'45"E	174.68'
19.	S.42° 47'40"E	240.53'
20.	S.47° 35'15"E	123.25'
21.	N.12° 14'45"E	123.11'
22.	N.15° 13'45"E	114.13'
23.	N.11° 24'00"E	90.79'
24.	N.42° 45'10"E	16.81'
25.	S.08° 37'48"E	486.48'
26.	S.26° 12'24"E	899.20'
27.	S.27° 37'48"E	1,087.50'
28.	N.88° 37'46"E	109.03'
29.	S.17° 38'00"E	69.63'
30.	S.53° 02'00"E	78.93'
31.	S.84° 16'00"E	77.75'
32.	S.17° 42'00"E	80.27'
33.	S.07° 38'00"E	122.74'
34.	S.73° 38'00"E	80.14'
35.	S.33° 08'00"E	77.37'
36.	S.30° 46'00"E	67.08'
37.	S.38° 13'00"E	63.03'
38.	S.17° 38'00"E	63.04'
39.	S.79° 38'00"E	53.59'
40.	N.79° 42'00"E	69.41'
41.	S.66° 11'00"E	74.29'
42.	N.34° 30'00"E	453.58'
43.	N.14° 35'00"E	38.19'
44.	N.39° 30'00"E	94.26'
45.	N.35° 30'40"E	53.07'
46.	S.85° 03'00"E	546.74'
47.	N.87° 26'44"E	698.30'
48.	S.88° 07'36"E	1,324.41'

NOTES:

1. THE AIRPORT BOUNDARY STARTS AT THE P.O.B. AND PROCEEDS IN A CLOCKWISE DIRECTION AS OUTLINED FROM COURSE NO. 1 THRU COURSE NO. 49.
2. PREPARED BY CITY OF OAKDALE ENGINEERING DEPARTMENT.

WADELL ENGINEERING CORPORATION

AIRPORT PLANNING • ENGINEERING • MANAGEMENT san francisco bay area



OAKDALE MUNICIPAL AIRPORT
A CITY OF OAKDALE AVIATION FACILITY
OAKDALE CALIFORNIA

AIRPORT PROPERTY MAP

SHEET

5

5

SHEET

SCALE AS SHOWN

JOB NUMBER	1105
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DRAWING NUMBER

DATE OCT 1995

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C124926704

